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What's It Matter?

For decades, the practical side of radio has been infected by a chronic "sloppiness" in matters mechanical. Radio types have long been the butt of jokes about never using washers, about drilling quarter-inch holes for eighth-inch screws, having only pliers and a driver in their tool kits, and so on. There's a heritage of sayings like "the circuit's the thing" and "what's it matter, as long as it works?"

The sorry truth is that this kind of observation has a foundation in fact. It requires no great feat of memory to recall radio receivers, record players and appliances that have been mechanically pitiful, with strings, drives, pulleys, tabs, levers and other gadgetry which could hardly fail to become a headache for servicemen in the field. A great many of these creations have represented the ventures into mechanical design of circuit-orientated personnel.

But if servicemen have been the victims, they have also been the perpetrators of mechanical misdeeds. It is a shocking thing to up-end an otherwise tidy chassis and to find one or more replacement components which have been "hung" carelessly in its works by an on-the-spot serviceman, accompanied sometimes by disarranged and charred wiring. This kind of treatment is highly cumulative and can turn a piece of equipment from something that is merely ageing into "a pile of garbage!"

And amateur operators are well known for the "rigs" they "knock together" out of "junk." The terms are part of the jargon, of course, but there are plenty of instances where they are highly apt. To be sure, not all amateurs—or hobbyists for that matter—have workshop facilities; nor have they bottomless pockets. But paint, care and workmanship with available materials are not necessarily expensive.

These observations are prompted by a couple of books reviewed elsewhere in this issue, particularly "Creative Electronics Fabrication," by O. G. Patrick. Texts like this—and there may be many others in current use—are worthy of close study by the rising generation of students and by others whose knowledge of the subject is sketchy.

In particular, would I recommend this class of reading to those who have generously undertaken responsibility for the many youth radio clubs now functioning.

N. Williams

ctober, 1966

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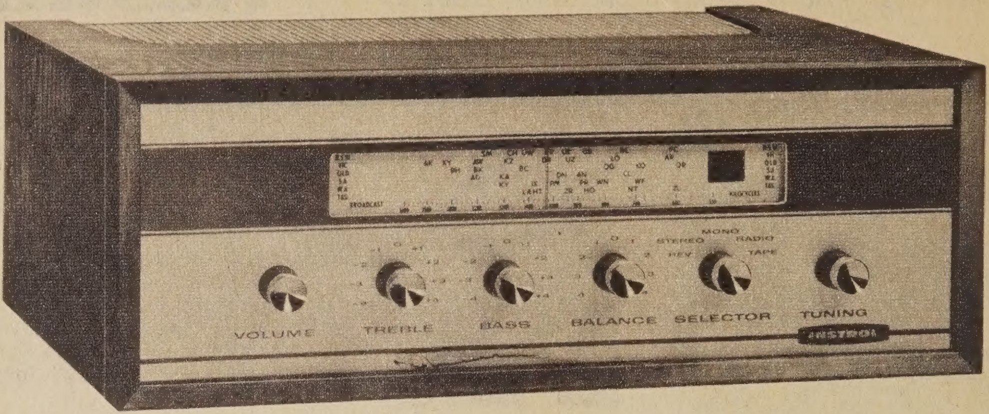
COVER PICTURE: Technical Editor Jim Rowe checks the operation of his "Digital Demonstrator," developed both as a tuitional demonstration unit and as a flexible "test-bed" setup for equipment designers. The unit is being cumulatively described in Mr Rowe's current series of articles headed "Logic and Counting Circuits." It is shown performing the operation of analog-to-digital conversion.

New INSTROL Amplifier-tune



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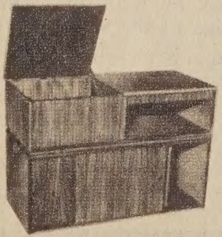

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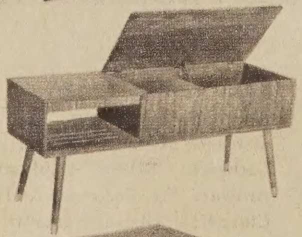
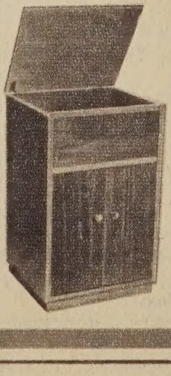
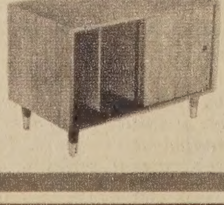
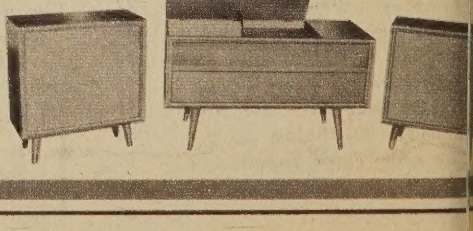




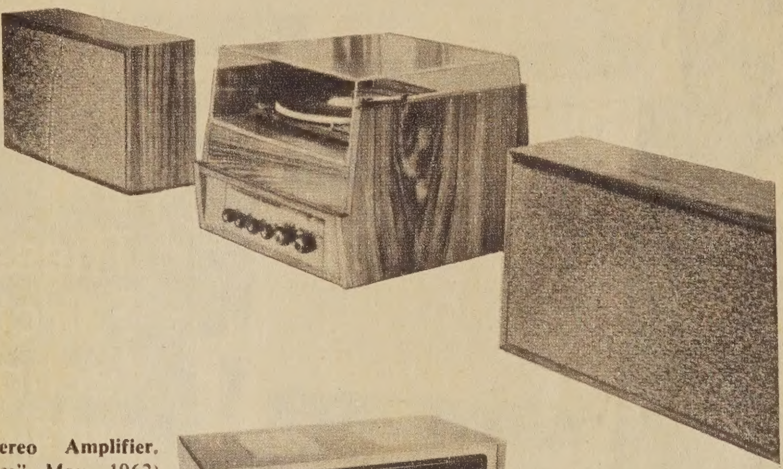


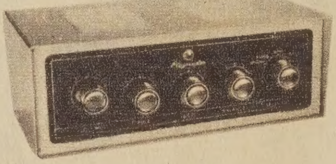


Produced precisely to the original designs by "Electronics Australia" (previously "Radio Television & Hobbies") the Instrol — Playmaster range includes units to suit every audio requirement. Tuners Amplifiers, Pre-Amps, Speaker Systems, etc., all available either as completely built and tested units, or in Kit form to build yourself. Our HI-FI Catalogue is available free upon request.

INSTROL—*PLAYMASTER*

Top right. The Instrol-Playmaster transistorised Stereo Amplifier No. 113 ("Electronics Australia," December, 1965 and March, 1966). Fitted in specially designed cabinet which also accommodates a record player. A pair of Instrol-Playmaster Bookshelf Speaker systems, make up a compact, reasonably priced outfit.





Instrol-Playmaster No. 4 Stereo Amplifier. ("Radio Television and Hobbies" May, 1962)

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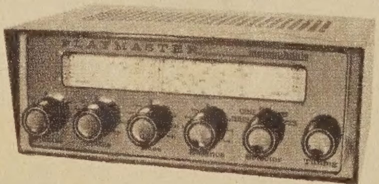
Instrol-Playmaster No. 106 Stereo Amp/Tuner. ("Radio, Television & Hobbies," December, 1963).

Kit of Parts	**$96.50**
Built & Tested	**$117.30**



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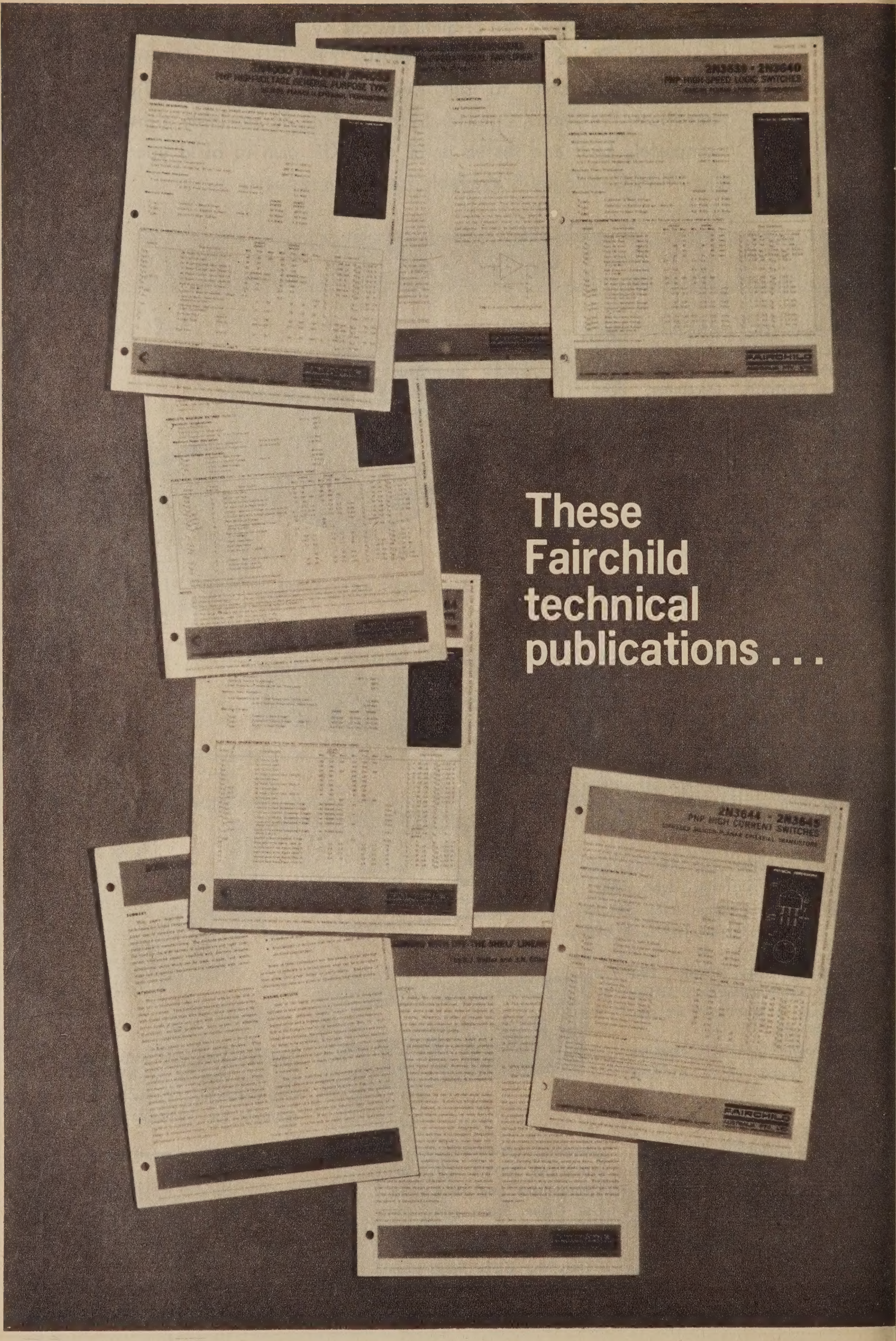
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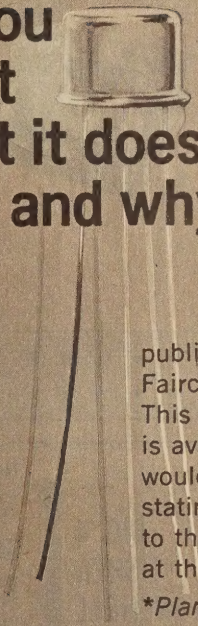

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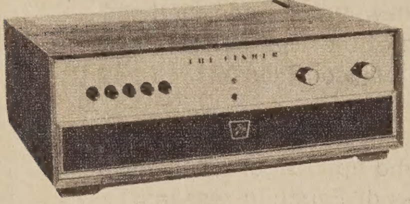

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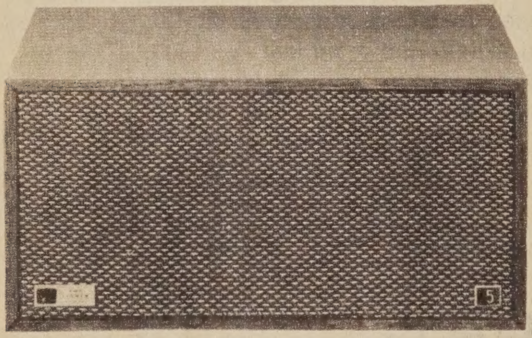

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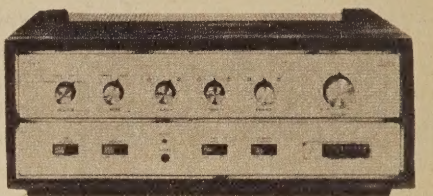

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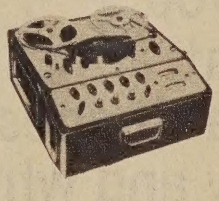
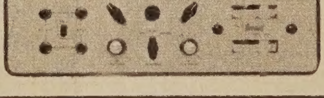


Model STB2. Half-track stereo mono, record/playback pl quarter-track playback, 4 hea illuminated edgewise meters, separate amps., twin recordi amps. with 4 inputs, each w individual attenuators, providi utmost flexibility with any co bination of programme source, channel mixing or mono. Tv playback amps. with variable o put via cathode follower. Adju able bias compensation. Optio extras, stereo power amplif with monitor speakers. Ster recorder from $645, mono fr $352.



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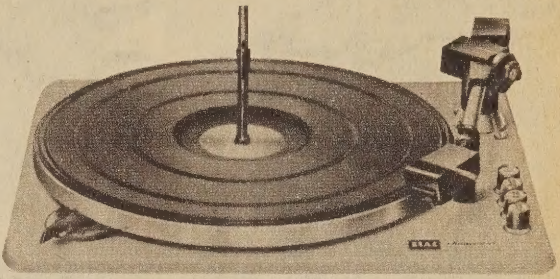

Factory cartridge installation ensures optimum playback quality and lowest record wear. Distortion and tracking problems eliminated.

Miracord 40 plays records manually or automatically, singly or in sequence, at all speeds. Features include: heavy, 1-piece, dynamically balanced 12" turntable; dynamically balanced tone arm; calibrated stylus-force dial; high-torque, 4-pole induction motor.

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**May also be purchased without cartridge.*

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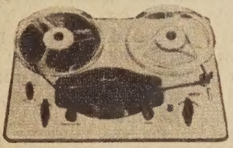

DECK. Mark 5 series 3-tape deck. Two switches control record, playback, wind and rewind — pause mechanism, plus special switch for superimposing. Deck fitted with ¼ or ½ track stereo erase and record/playback heads. Invaluable for recording speech with music or adding musical background. From $118.

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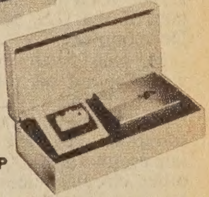

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CK-15-LS Lab Standard Phono Conversion Kit. U-15-LS cartridge (biradial diamond) for standard heads, and PS-15 power source. For magnetic or auxiliary inputs. **$94**

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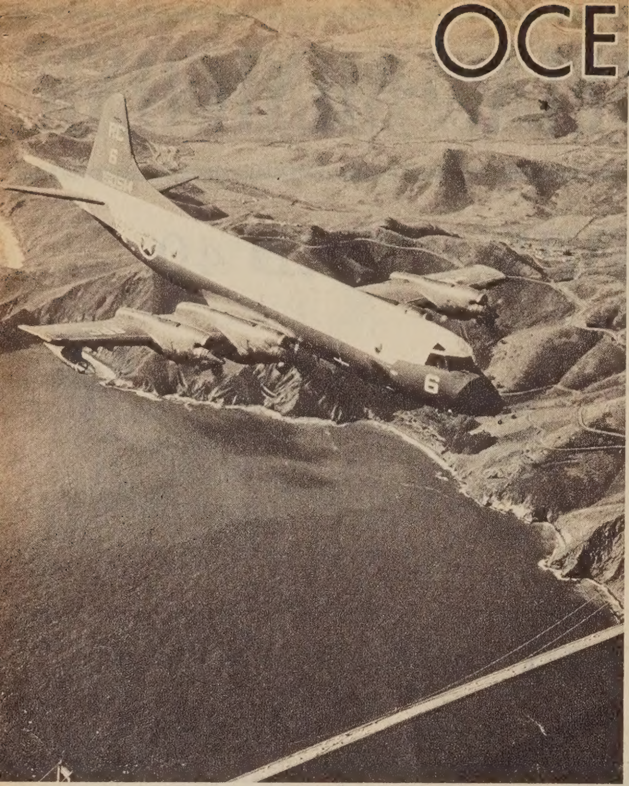
OCEANOGRAPHY

ASW motivate

The modern submarine, with its deadly nuclear potential, has emphasised vast gaps in our knowledge of conditions beneath the surface of the ocean. The development of sonar and other detection techniques is seriously impeded by lack of knowledge of pressure, temperature and salinity gradients in the oceans, giant subsurface waves, interface reactions and losses, and sea creatures large and small. That is why some of America's biggest companies are currently engaged in a crash program of "oceanography"—a program heavily studded with electronics.



The Lockheed P-3 Orion carries 2½ tons of electronic equipment to seek out lurking submarines.

"Success in ASW (Anti-Submarine Warfare) is directly dependent on how well we understand the oceans, their complex physical and biological characteristics, and the distribution and variation of these characteristics," writes Dr J. H. Wakelin, former Assistant Secretary of the U.S. Navy for Research and Development.

He goes on to say, "The use of underwater sound on which we must depend so much in ASW, is a case in point. Under some circumstances, underwater sound sources have been detected at distances up to 12,000 miles. Yet, under other circumstances similar sources may be undetectable a few hundred yards away.

"Many of the ocean parameters which affect underwater sounds, are variable parameters, which change radically in time as well as in space. We must concern ourselves with many inter-related factors—temperature, pressure, salinity, ambient noises, reflectors, scatterers, absorbers, topography, bottom conditions, internal waves, and reverberations."

A statement by Admiral Knoll illuminates the problem further, "If a sonar beam strikes an undersea mountain, it is either impaired or blocked entirely. To use modern sonars effectively, we must know where the mountains and plains are. Moreover, to predict the existence of the true convergence zone sound propagation path, detailed information is required on sound velocity not merely near the surface, but throughout the entire water column.

"Differences in sound velocity associated with oceanographic fronts, accompanied by drastic temperature changes or turbulence, can cause the true position of a target and its position as shown by sonar, to differ—just as does the (apparent) position of an object which you attempt to touch when it is below the surface or on the bottom of a pond. Unfortunately, we know too little about what causes such differences."

In helping to solve one of the Navy's major problems in this area, the Lockheed-California Company is concentrating on the problem of sound propagation in the oceans. Under contract with the Bureau of Ships and the Navy Electronics Laboratory, several experimental programs are being carried out which will serve to broaden our understanding of sound propaganda.

The work carried out at Lockheed runs the gamut from propagation in the surface duct, the surface layer of near-constant temperature (mixed layer), to long-range propagation utilising deep-water convergence zone and bottom bounce paths.

In the transmission of sound by bottom bounce, the ocean bottom acts as a variable, especially with respect to propagation losses. In cases where the bottom is level and smooth, the sound paths of a sonar beam can be predicted with fair accuracy but, where the sound is absorbed or irregularly reflected by the bottom, the reflected echo may be too indistinct for detection.

It is known, for example, that sand is a better reflector than clay, and that the physical properties of the various strata immediately beneath the sea bed also influence reflection loss. A very irregular bottom topography introduces still greater difficulties.

Sophisticated data collection and handling techniques are being developed at Lockheed for propagation studies of the surface duct and also for the long-range propagation studies.

For the first of these, experimental data is being recorded automatically at speeds far greater than heretofore feasible. In the other instance, high-speed digital computers are being used
on a research vessel at sea to calculat
acoustical propagation loss as a functio
of the sound velocity profile.

Biology plays a role in virtually ever
phase of naval operations. In the AS
field, the fouling of underwater detectio
equipment can sometimes be a problen
particularly in the shallow water e
vironment.

Of far greater importance to son
operations is the "pseudo-submarine
Little enough is known of submarine
counterparts. Porpoises, croakers, ar
snapping shrimp are well known f
their masking sounds. During darkne
dolphins, sharks and bioluminesce
schools of fish create torpedolike track

In addition, there is the proble
created by certain plankton and neckto
which show a rhythm in their movemen
they rise to the surface at nightfall an
descend the next morning. This curio
characteristic has long been observed o
echo-sounder records and is referred
as the "deep scattering layer." Its i
fluence on the performance of long-rang
sonars is still not fully known and r
quires additional research.

Since speed is vital in anti-submari
warfare, ASW personnel must acquai
themselves with the spurious, the decei
ing — the "false target" that moves
sounds similar to a submarine.

The "False Target Atlas" being pr
pared by the Lockheed-California Con
pany is meant to be a compendium
information on the distribution, appea
ance and behaviour of certain biologic
stocks of the sea.

The behaviour of potential false ta
gets is being gleaned from zoologic
journals, acoustics literature and biol
gical reports. This includes data on di
ing mannerisms, speed, response to tem
perature and sound-making propertie
All manner of neckton, drifting log
kelp masses, plankton and sound-produ

arge-scale undersea research program

benthos are being investigated.

Distribution of species is often quite tinct, and arrays of species are to be ınd in distinctive locations known as 'e zones." At night the biolumines- ıce of fish schools shows that certain cies move in characteristic configura- ns.

From patrol aircraft lunate schools anchovies can be distinguished from tear drop shape of jack mackerel mations. The tuna bears special in- stigation, for tens of thousands of se fish moving at once do present marine-like sonar features. Mola la, the ocean sunfish, is found oughout tropic seas, and its ten-foot gth and one-ton mass presents a de- tive target.

t is well known that certain sounds the sea can be traced to certain ani- ls. Although the function of most these sounds remains a mystery, it reasoned that animals must make m purposefully. In all likelihood, s are made to one another for atten- n, alarm, or rallying.

The garibaldi is notorious as a sound ker near the California coast; so is noisy sheephead, whose canine-like th fit him for scraping rocks clean algae. The toadfish off Florida is l known for his "boat whistle" chor- ng.

The poet's "silent sea" holds no truth the scientist seeking to detect weak ar echos.

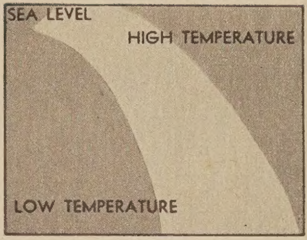
The Lockheed-California Company also engaged in studies of nd transmission across air-water in- faces to obtain air-sea communica- ns between a submarine and an air- ft without anyone else listening in. ce the friendly submarine is often important member of the ASW m, such closed-circuit communication highly desirable, in fact, necessary.

The total sound propagation loss be- en an airplane and a submarine is de up of three parts: **spreading** the nd energy over more and more area r it leaves the transmission point; **ection** from the water-air interface; **nuation** of the sound wave passing ugh water.

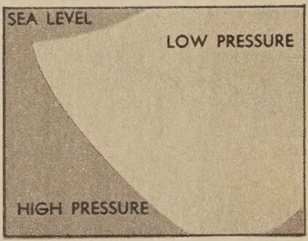
An objective of this study has been to ermine theoretically and by experi- nt what sound pressure levels exist r sound energy has been transmitted oss air-water interfaces. The dissi- ion that occurs is typically equivalent a path loss of 85 decibels between lane overhead and a submarine at t. At a depth of 400ft, the loss rises 5dB.

Optimistic conclusions have been ched that airborne sonar techniques be greatly enhanced by devising a idge" across the air-water interface, ch will reduce sound propagation es.

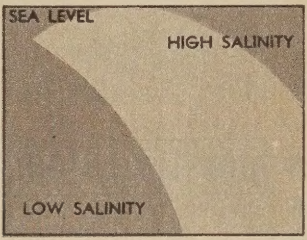
Yet another highly complex under- er-sound research study is being per- ned for the U.S. Navy to substan- e, modify, or disprove mathematical ories on the propagation of sound


SEA LEVEL
HIGH TEMPERATURE
LOW TEMPERATURE

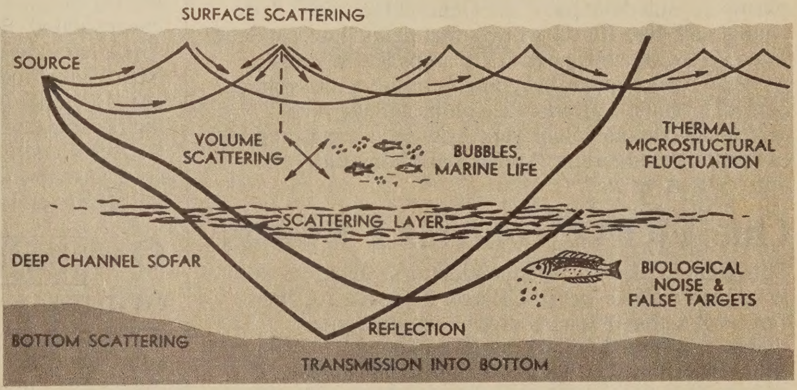
Above: A Sonar beam tends to deflect towards regions of low water temperature.


SEA LEVEL
LOW PRESSURE
HIGH PRESSURE

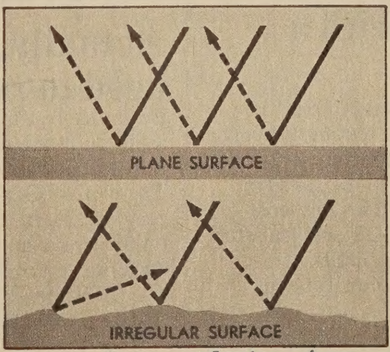
Above right: The beam favours regions of lower pressure, e.g., as caused by sub-surface wave motion


SEA LEVEL
HIGH SALINITY
LOW SALINITY

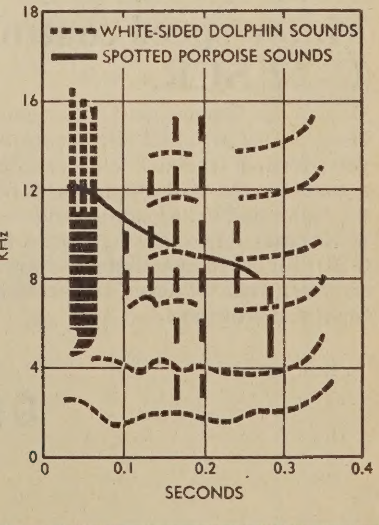
At right: Variations in salinity can affect a Sonar beam.


SURFACE SCATTERING
SOURCE
VOLUME SCATTERING
BUBBLES, MARINE LIFE
THERMAL MICROSTUCTURAL FLUCTUATION
SCATTERING LAYER
DEEP CHANNEL SOFAR
BIOLOGICAL NOISE & FALSE TARGETS
BOTTOM SCATTERING
REFLECTION
TRANSMISSION INTO BOTTOM

Quite apart from factors to do with temperature, pressure and salinity, the Sonar beam can be scattered and reflected by the surface and the ocean floor and by sea life of various kinds.


PLANE SURFACE
IRREGULAR SURFACE

Above: Sonar reflection from a smooth ocean floor is predictable but not from an irregular interface.



At right: Graph depicts audio and time distribution of sounds emitted by dolphins and porpoises.

Low-cost solid-state devices ca simplify your circuits if you know these key words.

New plastic-capsuled SCR.

Silicon controlled rectifiers used to be too expensive for automobile or portable-appliance circuits. A new plastic-capsuled flat pack, the General Electric C-106, changes all that. It's the world's first really low-cost SCR, rated up to 200 volts peak at 2.0 amps RMS. You can use it on battery-operated controls or other low-voltage control circuits. Automobile circuits and warning systems. Nixie or neon drivers. Low-speed ring counters or low-power inverters. And in many computer applications, as well.

One TRIAC controls 2 Kwatts.

This General Electric semiconductor switch does the job of two back-to-back SCR's on 240-volt AC lines. Trigger it with either a positive or negative gate signal (less than 3 volts!), and it can conduct current in either direction. The TRIAC can help you achieve a *three-to-one* reduction in components for circuits like these: lamp dimmers, home appliances, business machines, heating and air conditioning, commercial laundry or dry-cleaning equipment.

Motor-speed control with a C-22 SCR.

Do you use shunt-wound DC or universal motors? The General Electric C-22 silicon controlled rectifier can give you a form of feedback that's excellent for motor-speed regulation: the SCR output reacts both to the *speed* of the motor and to its *loading conditions*. This low-cost SCR comes in two housings (press-fit, C-22; integral-stud, C-20) for use in light dimmers, power supplies, inverters, static switches, temperature controls or electronic crowbars.

Silicon performance at germanium prices.

During the past three years, millions of G-E solid-encapsulated silicon transistors have gone into field u These low-cost devices now come in a total of 43 typ Nearly all of today's popular planar-passivated devic are represented: amplifier types, for use from audio t high frequency, and several categories of switching devices. General Electric simply eliminates the usual h cost, glass-to-metal seals and passes the savings on to you!

One unijunction replaces two ordinary transistors.

A high peak-current rating and a very stable trigger point make the silicon unijunction transistor ideal for oscillators, timing circuits, trigger circuits and pulse generators. It can replace two transistors of germaniu or silicon. Three-terminal unijunction transistors com in four series and in two case sizes (TO-5 and TO-18).

Actually, two words are all yo need to remember.

Be guided by them when you choose low-cost compon and you'll not only save money, but also add to the reliability of your circuits. And to their customer app The words? General Electric. You'll always find them on the latest in low-cost power semiconductors. For f on the whole line, contact your G-E representative. Or write *Australian General Electric Pty. Limited, 103 York Street, Sydney. Phone: 29-8711 and 552 Lonsdale Street, Melbourne. Phone: 67-8221.*

GENERAL ELECTRIC

Trademark

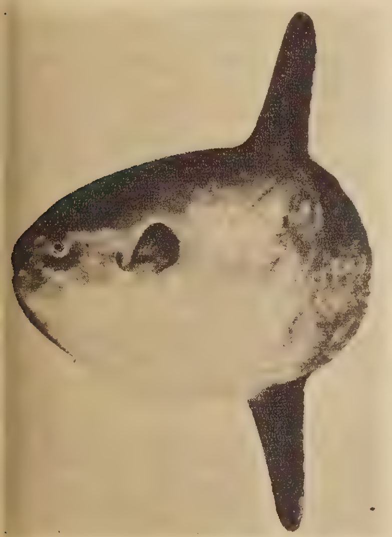
over long ranges in the sea. The theory now being examined, and known as "normal mode propagation," is of great importance to ASW. It is similar to the process by which radar waves are propagated in a wave-guide tube.

At sea, two large ships are being employed in experiments with several sound frequencies which are known to become partially trapped in the mixed surface duct. The mixed surface layer occurs frequently in the open sea. One of the ships is used to lower oceanographic sensors and long, vertically suspended strings of hydrophones, while the second ship slowly tows soundmakers through the water at varying distances.

By tying all the oceanographic information and acoustical signals together on to miles of magnetic tape processed through special multi-channel tape recorders, and by programming a shipboard computer to receive these inputs, it is possible to examine theories which are used to describe how sound should be propagated over long ranges in the sea.

This program, which combines the new aerospace technology with classical oceanography, is the most important research effort now being undertaken by Lockheed oceanographers.

Mention was made earlier of giant sub-surface waves. Rolling along beneath the surface of the sea — their presence rarely noticed — are some of the most gigantic waves of all. These are the "internal waves" which occur at the interfaces of different fluids or between layers of sea water of different density.



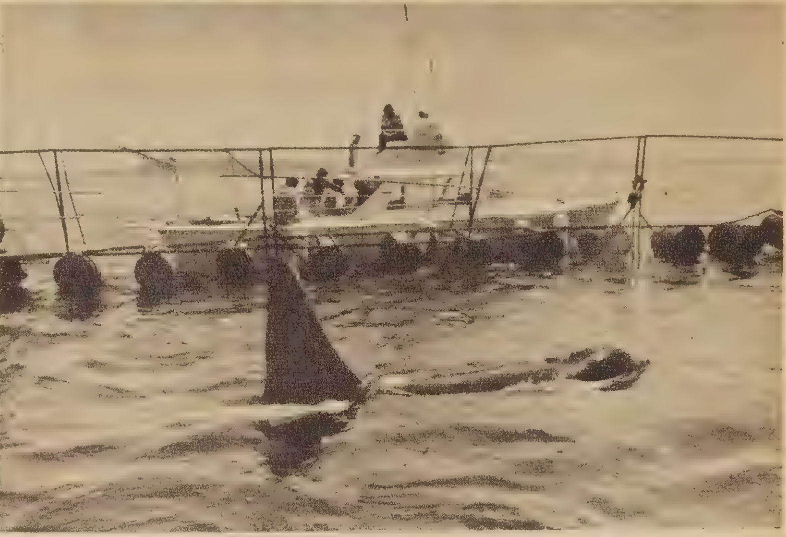
Mola Mola, the giant sunfish, ten feet long and a ton in weight, is a potential Sonar false target.

Internal waves far exceed the dimensions of surface waves which are formed by the wind. Both are regarded as "gravity waves"; that is, the restoring force is primarily gravity. However, the submerged waves can be far more ponderous because the gradients are less. An internal wave train may consist of crests which reach heights of 300 feet or more and an oscillation period of many hours.

A method for detecting and measuring these waves is to make use of water

(Continued overleaf.)

BOEING STUDIES "WHALE" TALK



A five-man scientific research team from Boeing had a unique opportunity, some months ago, to monitor and record the chatter of a captive, but very live, killer whale. Their studies will extend knowledge of bio-acoustics and provide further data for those concerned with A.S.W. (Anti Submarine Warfare) techniques.

By Ray Thomas

The 24-foot, 10,000-pound teenager blundered into fishing nets near Namu, British Columbia. The Boeing team conducted its research while "Namu" was being transported inside a floating pen to a Seattle aquarium. "We had a unique situation," said T. E. Heindsmann, Aerospace Group ocean scientist who directed the Boeing expedition. "There had never before been an opportunity to make continuous acoustical measurements of a mature, unharmed killer whale which was still in communication with others of its species."

During the five days the Boeing team operated, 23 reels of tape recordings were obtained, each reel some 1,500 feet in length. Allowing for editing, the tapes contain about nine hours of meaningful data to correlate with underwater movies and ocean measurements which were made at the same time. There is enough information to permit statistical analysis; before Namu there were only isolated samples.

The Boeing team had not been very long on station before it was apparent that Namu possessed and used a complex pattern of communications skills. There were squeals and chirps in numerous variety, some clearly audible though emitted far underwater. In addition, inaudible signals were used. In Heindsmann's words, "Namu emitted several types of sonar-like impulses and we were able to observe the returning echoes and reverberations, something never done before with killer whales."

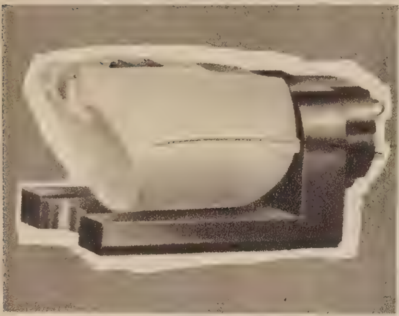
These whales have signals as individual as the voices of human beings, making it possible to tell which whale is talking. During the study, free killer whales swam outside the pen and held what sounded like an excited conversation with captive Namu. The expedition produced a carefully documented study of a species about which little was known. This adds to a body of oceanographic knowledge which has an almost desperate need for more and new data.

"We know more about the moon than we know about our own oceans," says Heindsmann, "and the oceans cover more than two-thirds of the earth. We hear a lot about growing populations and increased demands for food and minerals that possibly, at some future time, only the ocean can supply. But we know relatively little about the place where this is all supposed to happen."

The possibility that man might learn to communicate with whales by sounds is not too far-fetched.

The communications aspect has another angle which interests naval planners. A person sitting in an office hears typewriters, telephone bells, people talking, doors opening and closing. The listener selects whatever he wishes to hear from this welter of sound, automatically identifying each element. The sea is an equally noisy place—so much so that a sonar operator's toughest job is not to hear something over his headphones, but to know what it is that he is hearing. Can man learn to listen to underwater sounds as discriminately as a whale? ■

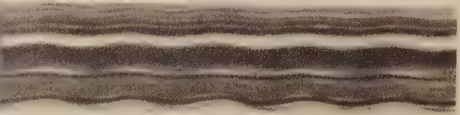
LITTLE SHORT OF
REVOLUTIONARY

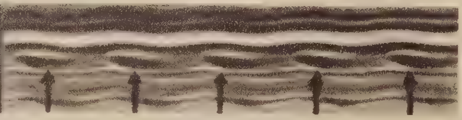


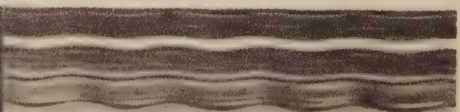
DECCA
Deram

MICROGROOVE "CERAMIC" CARTRIDGE
fitted with diamond stylus
for stereo or mono microgroove records

Micrographs of a groove recorded with a 10 Kc signal taken from three copies of the Decca stereo frequency test record SXL 2057.


UNPLAYED MICROGROOVE


AFTER ONLY 1 PLAYING with a good, average-priced cartridge. Arrows show damage


NO DAMAGE AFTER 250 PLAYINGS with Decca Deram

THE DECCA DERAM DOES LESS DAMAGE AFTER 250 PLAYINGS THAN THE AVERAGE CARTRIDGE DOES AFTER ONLY ONE

The Decca Deram has a tip mass of 0.6 milligramme; its compliance is 9 x 10—⁶ cms/dyne (lateral) and 5 x 10—⁶ cms/dyne (vertical); tracking weight 2.5 gms.; frequency response ± 3dB 18 c/s to 18 Kc/s.

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temperatures as a tracer. It enables o
to watch where the colder bottom wat
moves up to replace the warmer upp
layer and vice versa. More qualitativel
one can note the surface "band slick
which appear on calm days. The slic
correspond roughly to the troughs lyi
between the crests of these huge wav
as they move in passage.

Until the end of World War II, i
ternal waves were mainly a matter
academic interest, but in the late forti
speculations and subsequent theoreti
predictions were made that acoust
transmissions are related to intern
wave conditions. Since propagation
acoustical energy is influenced by d
sity gradients, it is also affected by t
occurrence of internal waves, whi
change the gradients.

Density gradients and therm
gradients are so closely interrelated th
Lockheed studies relating to densi
were conducted with vertically align
temperature sensors. To free the th
mistor array from the constant oscil
tions that would be experienced if
were suspended from a ship, sensi
units were attached to a buoyed verti
wire attached to an anchor in 3,600 f
of water.

The thermistors were spaced seve
feet apart in several groups, and set
record temperature at relatively f
quent intervals. A two-mile unders
cable connected the array to a sh
station, where data received was p
cessed through a digital recorder a
analysed.

The analysis showed that seaso
variations in temperature do take pla
It was also noted that intense aggre
tions of energy occurred at tidal peri
and in time spans of fifteen to twen
five minutes. Additional data on t
nature of the sound-channel axis ha
been obtained by these studies.

Not yet clearly distinguished, ho
ever, is turbulence and periodic, sho
term wave passage. These necessa
data will be collected not only to a
ment existing oceonographic inform
tion, but specifically to determine c
tain factors affecting fluctuations
ASW sonar performance.

Lockheed experts say that, because
the ocean's many and complicating f
tors, as discussed, the submarine—a
especially the modern nuclear-powe
type—still has the edge in the dea
ASW hide-and-seek game.

However, it is not altogether a o
sided affair and lurking submarines c
not take liberties with the U.S. Navs
detect-and-destroy groups, headed
Lockheed's deadly "Orion," pictured
the head of the article. Developed fr
the well-known Neptune aircraft,
Orion will shortly be delivered to
R.A.A.F.

The aircraft is equipped with speci-
ised acoustical and electronic ASW
struments. These integrated ASW avions
lead to strange names: "TACC
"JULIE," "JEZEBEL" and "MAD."

TACCO is a name given to the ta
cal co-ordinator for the group. He
in front of his integrated display cons
much like a television director, call
for whichever of the tactical systems
give him the best picture of the sit
tion.

The JEZEBEL system incorpora
buoys with hydrophones suspended
neath the ocean surface. "Seeded" i
the ocean according to definite patte
the hydrophones pick up noises ema
ting from a submarine. The advant

(Continued on Page 128)

WESTINGHOUSE UNVEILS ITS "DEEPSTAR" SUB

Vestinghouse Electric Corporation recently unveiled its deep-sea research iicle, Deepstar-4000. Deepstar is deied to dive to a depth of 4,000 feet periods of up to 24 hours. It travels ler its own power at underwater eds of up to three knots. It will carry rew of three men—a pilot, an obver and a co-pilot or second observer.

The vehicle is one of a "family" of p-diving submersibles which are in ier design or construction stages. epstar-12,000, for example, has been igned and components are being de. Deepstar-20,000 is in an early ign stage.

The nine-ton Deepstar-4,000 is eduled to undergo a series of tests, luding shallow dives in the Chesaike Bay. Following the bay tests, the iicle will be flown to California for p-dive tests to 4,000 feet.

The Deepstar project is one of the ivities of the Underseas Division of Westinghouse Defence and Space itre at Baltimore. Manager of the iject is Benjamin F. Moore.

Deepstar-4,000 was designed with the p of French undersea pioneer Captain ques-Yves Cousteau's research group, ice Francaise de Recherches Sousirines, in Maiseilles, France. Its hull l propulsion motors were fabricated the Westinghouse Marine Division at company's Sunnyvale, Calif., plant. e vehicle was assembled and undernt preliminary testing in France.

The high-strength steel pressure hull the vehicle is spherical and has been cessfully tested for strength at a ssure as great as that found at a sea oth of 5,000 feet.

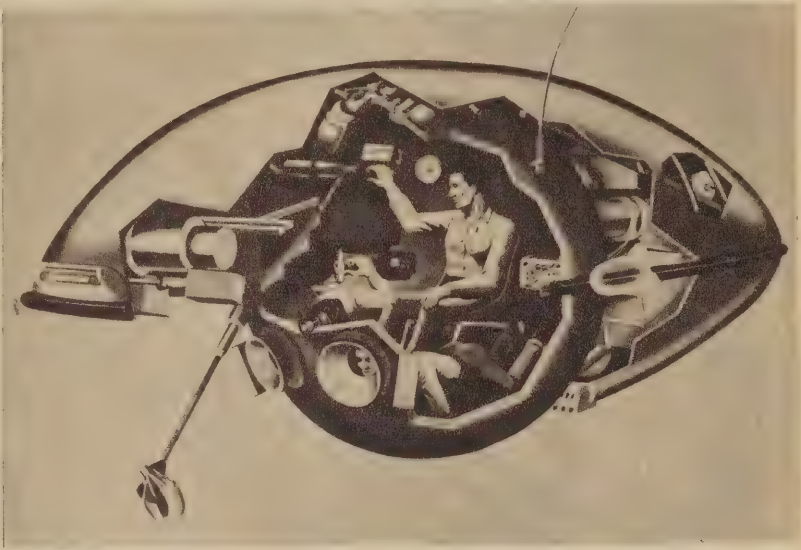
Surrounding the pressure hull is a drodynamically shaped fairing 18 feet ig, 7 feet high and 11½ feet wide. Conned within the fairing is equipment propulsion, lighting, controls, photoiphy, and sample collection. The prese hull houses the crew, operational iipment and instruments.

The two 4.5 h.p. electric motors, one each side, used to drive the Deepr, will operate under high pressure iile flooded with fresh or salt water. signed in Sunnyvale, California, by estinghouse marine engineers, the ee-flooding" motors utilise "wet" windgs and water lubricated bearings. These itures are refinements of a concept st used in motors pumping water from ep underground wells.

Mr Moore said that the Deepstar-00 becomes a key element in the iderseas Division's charter facilities ogram. This is a world-wide diving vice which includes a submersible hicle, its "mother ship" and an expericed crew of technicians and engineers.

The diving service includes such seres as placement of instruments in derwater environments underwater otography, military and commercial vage operations, ocean-bottom exoration, sampling and coring and other h activities.

Advancing technology, geopolitical nsiderations, and the prospect of thinig resources on land are some of the isons for increased activity in oceanography and exploration of the over 70 per cent of the earth's surface that comprises the world ocean.



Cutaway drawing of the Deepstar-4000, with its crew of three, one seated and two prone. Lockheed is developing a comparable vehicle.

The submersible is positively buoyant and obtains its buoyancy from the pressure sphere and syntactic foam. The foam has a specific gravity of 0.60 to 0.65 and a water absorption of less than 1 per cent after 1,000 hours immersion at a pressure of 5,000 pounds per square inch. Comprehensive strength of the syntactic foam exceeds 9,000 pounds per square inch.

Electrical power for the Deepstar-4000 is supplied by three separate standard lead-acid batteries with a capacity of 430-ampere hours at 125 volts output. One battery is located forward of the pressure hull and two are aft. Each battery weighs 1,000 pounds and has a minimum life of two years.

Fabricating the pressure hull at the Sunnyvale, Calif., plant of the Westinghouse Electric Corporation's Marine Division.

Navigation and recording equipment located inside the pressure sphere includes a gyrocompass, high-resolution sonar, a two-way radio, tape recorder, and two echo sounders.

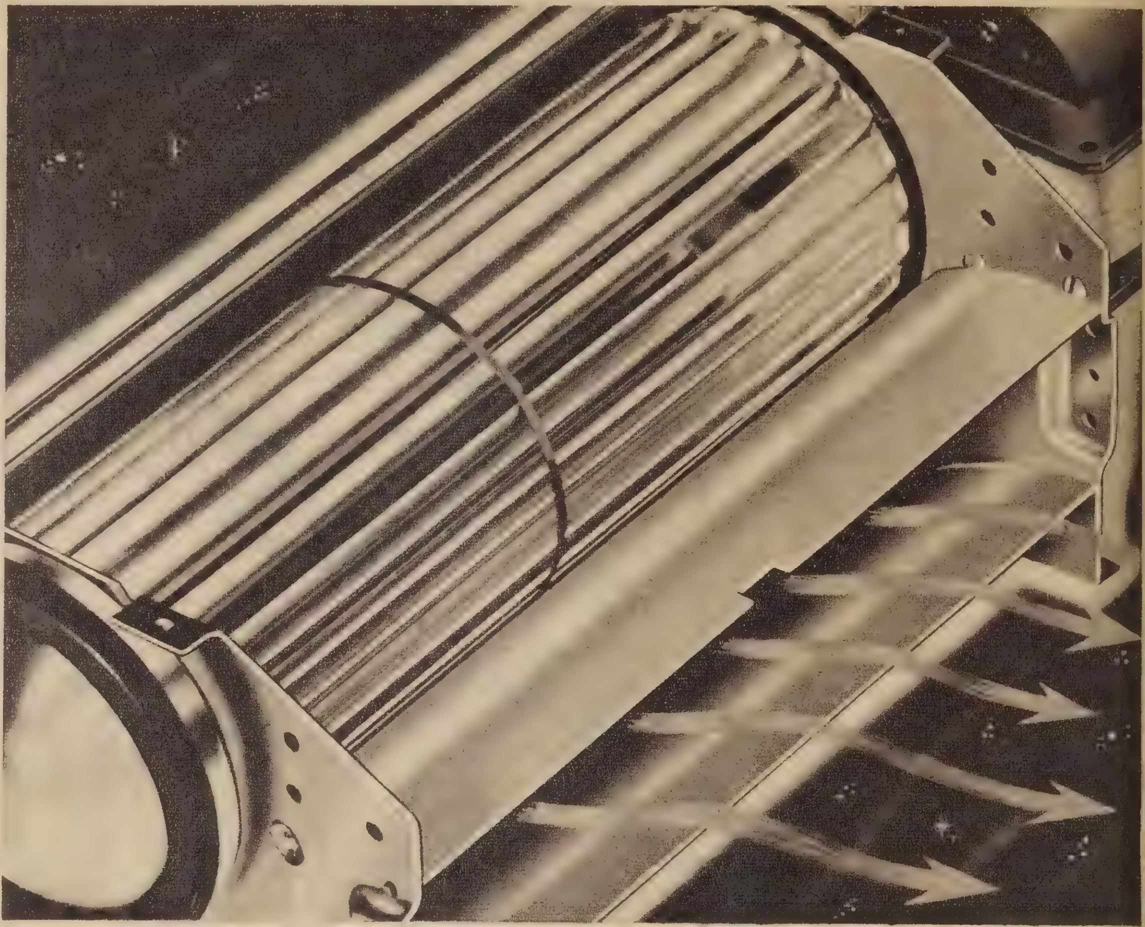
External accessories include a lamp-carrying arm with hydraulic remote control for use with movie camera, strobe flash and still camera mounts, a prosthetic arm with sample collecting tongs (also operated by hydraulic remote control), a sample basket, and a running light.

A mercury system controls the pitch of the vehicle. Two large, fast-acting hydraulic pistons in forward and aft tanks pump mercury back and forth rapidly shifting the vehicle's centre of gravity. This tilts the craft upward or downward.

The submersible is propelled by two 14-inch-diameter propellers, one on each side of the vehicle. Reversing one propeller turns the vehicle about its vertical axis.

Descent by negative buoyancy is controlled by one large and several small descent weights located aft on the fairing. Fine control of the vehicle's depth is either by a system of cylindrical ballast tanks, which can be flooded with seawater for negative buoyancy, or by a system of small weights.

The life support system provides adequate air for the crew for 48 hours. It consists of a closed-circuit respiratory system with pressure-regulated-flow oxygen cylinders, a carbon dioxide absorber, a carbon dioxide concentration indicator, and humidity control equipment. Safety features include manual ballast and battery releases for emergency rapid descent, an inflatable conning tower, an inflatable life raft, a radio set, and normal emergency breathing apparatus. ■



Maintaining constant airflow at temperatures down to —35 C.

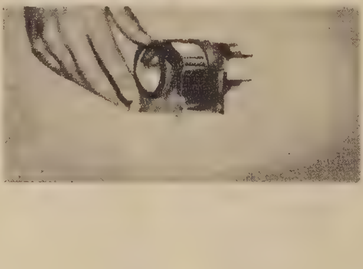
This sturdy, small-scale air-moving system is designed for building into refrigeration equipment—or anything else that requires air movement. STC Transverse Flow Blowers (Series QLD) incorporate compactness and high efficiency. The extra advantages of constant airflow (99% whirlfree), long range of airstream and virtually silent operation are assured. Characteristics include: Stable pressure/air output over the entire working range; robust mechanical construction and reinforced self-lubricating sintered-bronze bearings for long service life.

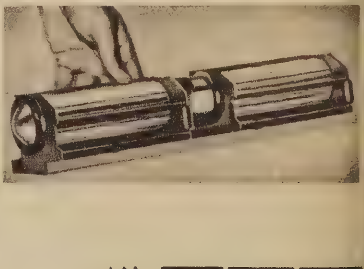
Standard design series QLD blowers are suitable for operation in ambient temperatures of 0 to 60 C. (- 32 to 140 F.). Other models, available on special order, extend this temperature range to 35 C.

For further information, write to:

Standard Telephones & Cables Pty. Limited, Components Division, Moorebank Avenue, Liverpool, N.S.W. Phone 602-0333. Melbourne 44-5161, Canberra 9-1043, Brisbane 47-4311, Perth 21-6461, Adelaide 51-3731, Launceston 2-2231.

STC Transverse Flow Blowers





STC

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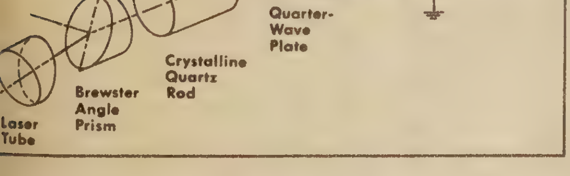
Laser Beam nformation Storage

One hundred million its of information er square inch of hotographic film

Dr M. A. Habegger, of IBM's Development Laboratory at Poughkeepsie, N.Y., adjusts the selector, consisting of a series of special crystals and prisms (see diagram below). It determines which colours the laser (at right) will generate and emit.

An experimental device which changes the colour of a aser beam at electronic speeds has been developed by IBM cientists in the U.S.A. The scientists believe it could lead the development of colour-coded computer memories with p to a hundred-million bits of information stored on one quare inch of photographic film.

The wavelength (or colour) selector, as the device is alled, consists of a series of special crystals and prisms laced within a laser which generates a multi-colour light eam. By applying proper voltages to certain of the crystals l colours are blocked except the one selected.



Experiments in the development laboratory of IBM orporation at Poughkeepsie indicate the feasibility of 25,000 colour selections per second. Previous colour selecon techniques proved too slow for use in computers.

Photographic memories in which tiny spots on film present the "ones" and "zeros" of computer language have eviously been described by computer scientists. The highensity storage system now envisaged, using the laser colour lector, would be attainable in a system where the "ones" nd "zeros" are stored in layers, according to colour, in the m's emulsion.

With a reversible photosensitive medium, such as photohromic glass, the selector could be used as the key element a high-speed, high-density memory in which one colour ould record information in the medium, a second colour ad the information, and a third colour erase it.

The colour selector also shows promise for optical mmunications. Colour-coded light beams could carry information, in place of wire or cable, either within a computer or between remote points.

The experimental laser wavelength selector developed by IBM is used with an argon-ion laser, though it could be modified for operation with any multi-colour laser.

Argon-ion lasers emit a multi-colour light beam—that is, a beam which normally oscillates at several frequencies simultaneously. The selector is placed within the laser's cavity and is so arranged that light of the selected wavelength passes through with little loss in intensity, while all other wavelengths suffer losses too great to achieve oscillation. As a result, a laser will oscillate at the selected wavelength only, producing a single colour beam.

The selector comprises a crystalline quartz rod, a quarter-wave plate, potassium dideuterium phosphate (KD*P) electro-optic crystals and Brewster angle windows. These elements are tightly stacked with a film of silicone oil between them to minimise light loss. Electrodes attached to the KD*P crystals provide electronic control for colour selection. Laboratory tests have shown the feasibility of electronically switching the crystals more than 125,000 times a second.

How It Works: The selector components combine to control the polarisation of the laser beam. Light of the desired wavelength is polarised in one direction while light of the unwanted wavelengths is polarised in a different direction.

The beam emerging from the laser tube is linearly polarised with respect to the first of two Brewster angle windows to reduce reflection losses. After passing through this window, the beam enters the crystalline quartz rod, where the plane of polarisation is rotated by an amount proportional to the wavelength of the light and is elliptically polarised after it passes through the quarter-wave plate.

On passage through the KD*P crystals, light of the selected wavelength again becomes linearly polarised while light of all other wavelengths remains elliptically polarised. The wavelength selected is determined by voltage applied to the crystals.

The beam then passes through the second Brewster angle window, which is so oriented that elliptically polarised light suffers losses while the linearly polarised light (the wavelength selected) does not.

A mirror feeds the light back through the selector to the laser tube, thereby achieving oscillation at the selected wavelength.

Reference: This experimental system is reported in the IBM Journal of Research and Development, Volume 10, Number 4, July, 1966, in an article by Dr Millard A. Habegger, Thomas J. Harris and Dr Erhard Max, of IBM's Development Laboratory in Poughkeepsie. ■

A typical application where stress graded timber can provide considerable cost savings. The grading stamp is visible on many of the supports.

Electronic Timber Grading

By BILL BAVERSTOCK

Timber, until now, has suffered from the serious disadvantage that the strength of individual pieces could not be accurately measured. As a result large and costly safety margins had to be allowed, putting timber at a disadvantage with other materials. But now, thanks to an Australian invention, this has all been changed.

One of the first essentials to the design of any structure is an exact knowledge of the stress each member must bear without risk of failure. With steel this is merely a matter of quick reference to the table of working loads provided by the manufacturers for all their products, but until recently the safe working loads of timber has been another matter.

Formerly, timber has been graded for strength largely on the experience of sawmillers, governed by certain rules. Recommended by the Standards Association, these rules assessed the relative strength of faulty timber in comparison with clear timber by limiting the sizes of knots visible on its surface. This knotty timber was graded to 60 per cent of clear timber when it had knots up to a quarter of the width o the face in which they appeared.

These visual grading rules rest, i some cases, on actual experimental work carried out by research organisations i an attempt to formulate satisfactory standards. In other cases, they are merely a guess made on the basis o very incomplete data and consequently are inaccurate predictions. The mere appearance of a defect is at best a crude guide to its effect on the strength of the timber.

The limitations of this method o grading have played a big part in discouraging the use of timber, in engineered structures, against the competition of materials such as steel and concrete whose exact strength is known. When timber has been used it has been customary to provide a substantial margin of safety by specifying members heavie than necessary, causing waste o material and increased costs.

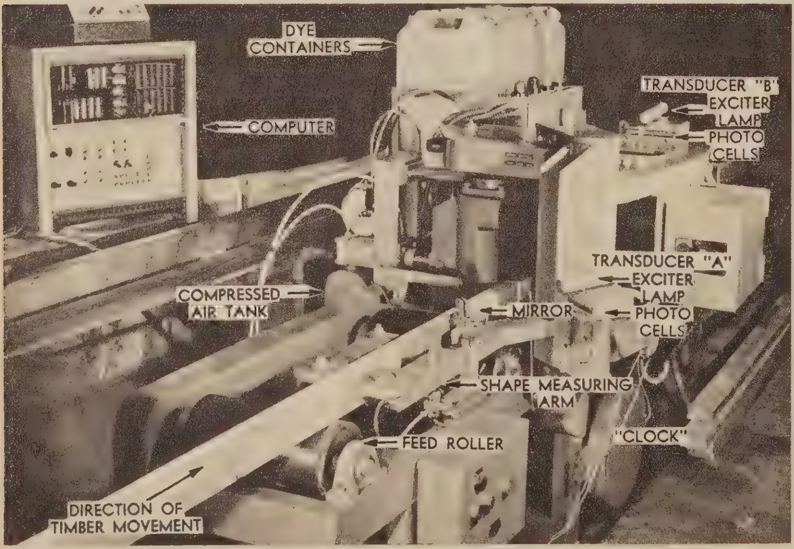
But now, due to the development o a grading machine by the Wood Technology Division of the Forestry Commission of N.S.W., accurate mechanica grading of timber is a reality. Th Mechanical Stress Grader developed b technical officers of the division is th only machine in the world that accu ately and thoroughly grades timber tha is passed through it. It does this b making use of a correlation between th stiffness of timber and its bendin strength.

The machine consists of a pair o vertical power-driven rollers, 36in apart between which is a loaded roller whic forces the timber against them by pressure exerted on the other side of i The plank is put on edge and carrie into the machine on horizontal powe conveying rollers. Its leading end passe between a pair of open power feed rolle which, sensing its entry, close automatically and convey the plank into th "loading zone." When the leading en of the plank reaches the second vertica roller, a sensing device operates th loaded roller in the centre of the spa between the vertical ones.

The amount by which the loade roller deflects the timber is sensed b a deflection measuring roller opposit the loaded roller and, depending on th group into which the deflection falls a any given spot in the plank, actuates spray head which marks the timber wit a coloured spray.

As each spray is applied, a correspondingly coloured lamp flashes.

When the trailing end of the plan leaves the vertical power feed rollers



The latest version of the stress grading machine which measures, memorises, and allows for variation in timber shape when determining its strength. Reference to the diagram opposite and the text will explain the operation of the computer and memory.

e open ready to admit the next piece. loading roller is unloaded and the ur marking system is switched off.

y a glance at the colour marks on plank when it emerges from the hine the operator can tell immedi- y into which grade it has been ed. The colours range from white ich means that no spray has been ap- d) indicating grade 1, through green, ow, black and red. A red spray in- tes rejected timber and combinations colours indicate various grades from le 1 to grade 7.

he operator puts the timber into ap- priate groups by noting the lowest ngth point marked on the piece.

he presence of a knot in an other- clear plank is indicated by a short steak revealing at a glance the weak in the timber. Many rejected pieces be upgraded after the red-marked ct is docked off.

he system just described has one ic limitation. Small bends or other ral distortions in the shape of the ber can be interpreted by the machine as deflection due to pressure from loading roller, and thus cause a de- mark to be made indicating a weak- which does not, in fact, exist.

his can be overcome by feeding the e piece of timber through the machine a second time, but turned over so pressure is applied to the opposite . After the second run, comparison veen the marks indicates the grade imber. In general, a simple set of rules allows an "average" grading to be assessed from the markings on both sides, but a red marking, even on one side, is always interpreted as a defect which must be rejected.

Although giving a satisfactory end result, this arrangement has the disadvantage that it calls for handling of each piece of timber, thus adding to the cost. To overcome this a "left hand machine" has been developed which applies force to the face opposite to that on the conventional machine. The two machines may then be run in tandem without the need to turn the timber over or handle it in other ways between tests.

However, the most recent development is aimed at eliminating the need for a second machine. This uses a small computer in conjunction with a shape measuring arm, which measures deflections in the timber in its unloaded condition before it enters the loading zone. This shape is "memorised" by the computer and, as the timber is moved past the loading roller, the computer is able to decide whether a movement of the deflection measuring roller is due to a defect or the natural shape of the timber.

In this version of the machine there are two transducers; a shape measuring transducer (transducer "A") and, following it, the original deflection measuring transducer (transducer "B"). Both use the same kind of mechanism to convert timber movement into electrical values. As far as transducer "B" is concerned, this is a refinement on the older design, which used a simple combination of four microswitches.

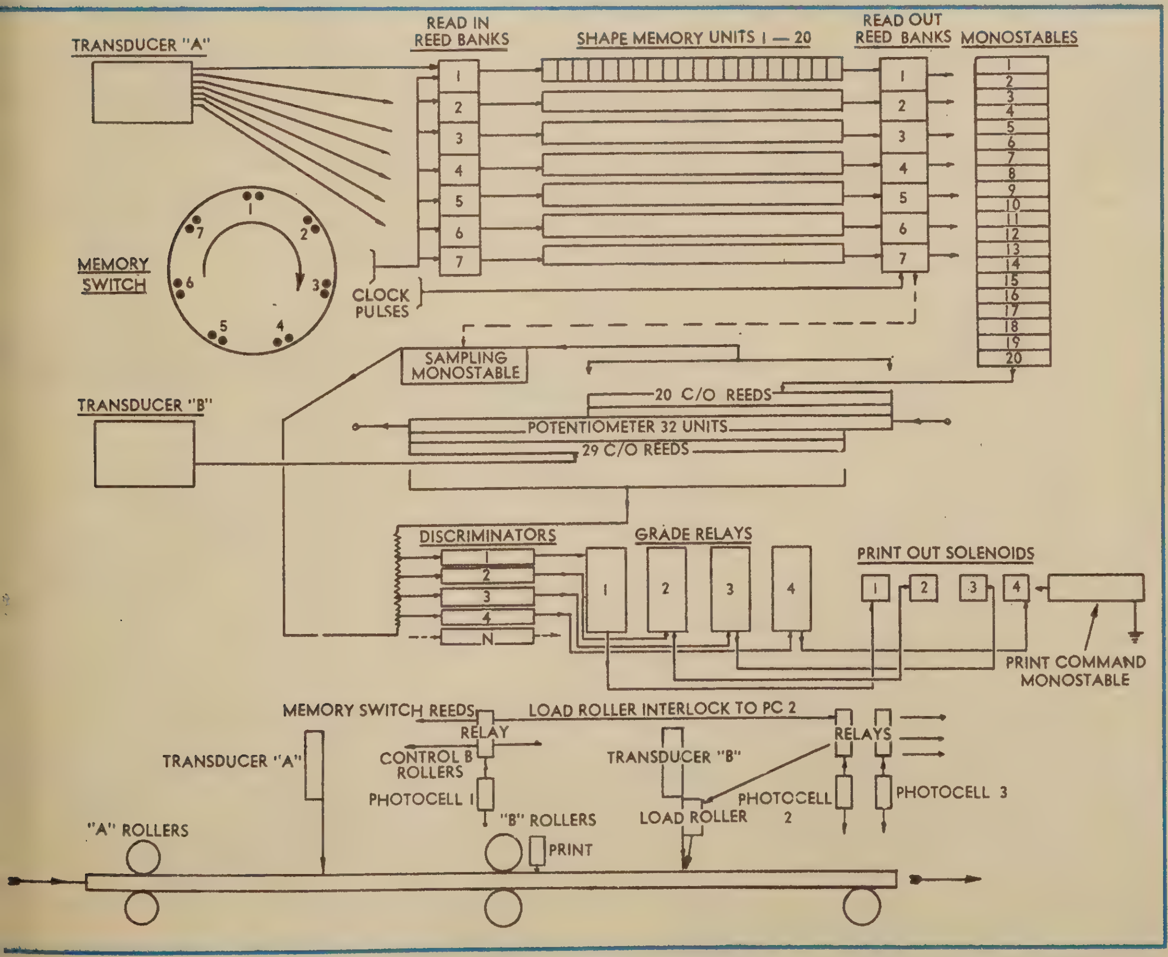
Each transducer consists of a roller fitted to the end of a pivoted arm, the roller bearing against the face of the timber. At the pivoted end of the arm is a mirror which reflects light from an exciter lamp on to a battery of 20 photo-cells, the position of each cell corresponding to a movement of the measuring roller equal to .02in. Thus the information regarding the plank's deflection at any moment is sensed by one of the cells in the battery and fed to the computer.

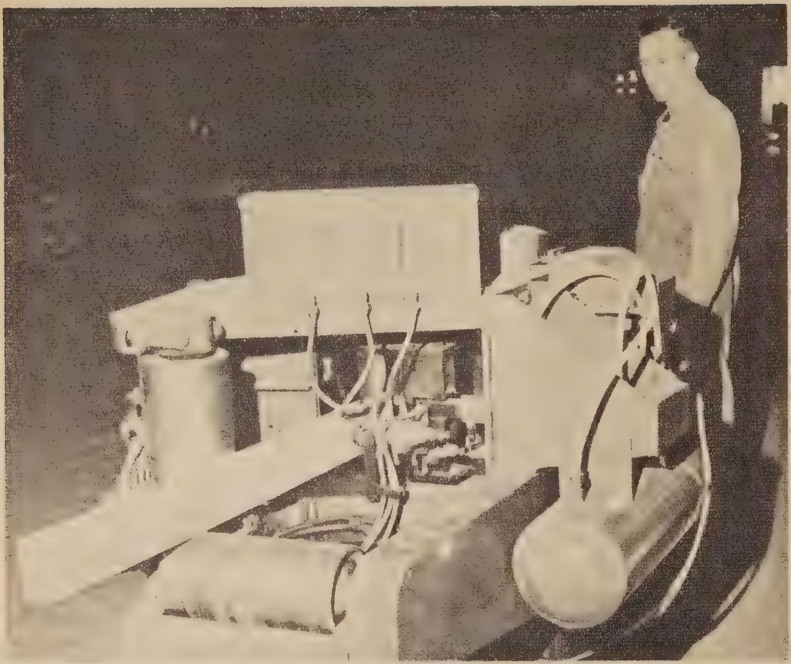
The computer's memory is a relatively simple arrangement — as computers go—and for this reason alone it is worth considering in some detail. For those readers to whom the computer is an unbelievably complex black box, this explanation may provide a welcome breakthrough.

The actual memory units are capacitors and there are seven banks of these, with 20 units in each bank. Thus, in each bank, there is one memory unit for each photo-cell in the transducer. Associated with each memory capacitor is a reed switch which functions as a relay between the photo-cell and the memory unit capacitor.

As any particular photo-cell is energised by a beam of light it completes a circuit through the energising coil of its own reed relay, causing the reed contacts to close. When they do, they complete another circuit which causes the memory unit capacitor to

his block diagram should be studied in conjunction with the text for a clear understanding of how the computer operates.


TRANSDUCER "A"
READ IN REED BANKS
SHAPE MEMORY UNITS 1 — 20
READ OUT REED BANKS
MONOSTABLES
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
MEMORY SWITCH
CLOCK PULSES
SAMPLING MONOSTABLE
TRANSDUCER "B"
20 C/O REEDS
POTENTIOMETER 32 UNITS
29 C/O REEDS
DISCRIMINATORS
N
GRADE RELAYS
PRINT OUT SOLENOIDS
PRINT COMMAND MONOSTABLE
MEMORY SWITCH REEDS
LOAD ROLLER INTERLOCK TO PC 2
RELAY
RELAYS
TRANSDUCER "A"
CONTROL B ROLLERS
TRANSDUCER "B"
PHOTOCELL 1
PHOTOCELL 2
PHOTOCELL 3
"B" ROLLERS
LOAD ROLLER
"A" ROLLERS
PRINT



An early version of the stress grading machine, before the addition of the shape measuring facility. The load roller can be seen in the centre of the picture. It is powered by compressed air.

be charged. This charged capacitor then represents one item of information stored in the computer's memory.

The above applies to only one bank of memory units at a time. A seven position rotary switch, driven from the main machine shaft, in effect switches the bank of 20 photo-cells from one bank of memory units to the next, as the timber moves through the machine. This switch is called the "clock" mechanism of the computer.

In fact, it really switches the energising voltage to each bank of reed switches, the photo-cells being permanently connected. This simplifies the switching mechanism. Also, as each bank is "switched off", any reed relay that was closed and holding a capacitor in a charged condition will open, leaving the capacitor charged and with no circuit through which it can discharge. Thus it remains charged until subsequently read out by another section of the same clock switch.

Let us assume, then, that we start a piece of timber moving through the machine and that the clock switch energises (say) bank number one of the memory at this instant. As the timber advances the clock switch rotates and, after six inches of movement, energises bank number two. If there has been any change in the shape of the timber, this will be indicated by a different photo-cell being energised. This process continues until all seven banks have been energised, after which the switch reverts to the number one bank and the process is repeated.

However, before number one bank is used again the information it originally held is read out and erased. Since it is not feasible to store information in any particular bank at the same time as it is being read, the practical storage of the memory system is really only six banks which, at six inches per bank, represents a timber length of three feet. This is exactly the distance between the shape measuring roller and the deflection measuring roller.

Thus, by the time that section of the timber originally memorised in bank number one reaches the loading roller, the readout section of the clock switch has begun to read bank number one and feed it to a comparison circuit which, at the same instant, is receiving information from the deflection measuring transducer (transducer "B") representing the amount of deflection sensed by the deflection measuring roller.

MECHANICALLY STRESS GRADED 4x2

The latest machines can print the size, the miller's symbol, and a grading code on the timber as it is processed.

If comparison of the two pieces of information, i.e., one from the deflection measuring roller and one from the memory bank, shows that the amount of deflection in the timber is the minimum that would be expected from it under load, plus — or minus — any natural distortion which was present before the load was applied, then the machine will grade it as top quality. Alternatively, greater orders of deflection, again by comparison with its natural shape, will initiate suitable grade makings, right down to "reject."

As mentioned earlier, the photo-cell transducers measure the timber movement in steps of .02in and, since there are 20 steps, are capable of measuring a total movement of .4in or, with the system "at rest" in a normal mid position, a movement in either direction of .2in. This mid position is represented by photo-cell number 10 in the bank.

However, the ratio of .02in per photo-cell is not a fixed one. It can be change relatively easily by moving the photo cell bank either closer to or furthe away from the mirror.

The division's technical staff is nov developing a mechanism that, instructe by the computer, will automatically stac timber according to its grading. Alread a device is in use on a stress grader in big Sydney sawmill and joinery factor that prints the grade, size and miller' name on each piece of graded timber a it leaves the machine.

Patent rights to the stress grader an its appliances are held by the Forestr Commission of N.S.W. and wide interes in the machine has been expressed ove seas. The machines are made by Isle Forge and Engineering Company c Coffs Harbour, N.S.W., a prominen firm in the timber and sawmill equipmer industry, and it has shipped stres graders to New Zealand, South Afric and Rhodesia.

The Russian timber industry has e pressed interest in the machine and the will also be made under licence in th U.S.A., Canada and South Africa. Mach ines at present in use have a speed c 200 feet per minute, but later mode will operate at up to 500 feet. The mach ines were built under the supervision c Mr E. B. Huddleston, Chief of th Division of Wood Technology, and M H. E. Booth, officer-in-charge, Timbe Physics Section.

Already, economic benefits resultin from machine grading are impressive. enables high strength timber to selected and used for heavier loadings, in rafters and floor joists. In the pr fabrication of roof trusses for house co struction, lighter high-strength materi can be used in longer span trusses, th saving time and money by eliminatir the need to use timber of larger sectio

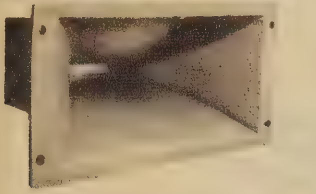
Another recent application for stre grading has been the selection of abo 12,000 ladder stiles for use in ladde ordered by the P.M.G.'s Department. this case, the machine is doing somethi which might be impossible to achieve any other way, that is, detect hidd faults which, otherwise, could eas endanger people's lives.

Similarly, scaffold planks used by cc struction companies need to be free frc hidden defects and one of the electric authorities has recently taken advanta of stress grading to achieve the requir order of reliability.

Other suggested applications whi could benefit from the system are bc building, and light aircraft, sailpla and glider construction.

At the sawmill, machine gradi makes possible a higher yield of str tural material by accepting pieces wh probably would be down graded wh subjected to visual grading. Even re tively low strength grades can find a in some parts of framing. The str grader now makes available to engineer and architect a material f from the vagaries and uncertainty ass ated with visually graded timber.

DECCAKELLY



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NEW 15" WOOFER SPEAKER (Mk. VII)

ted at 50 watts, the frequency response of new bass reproducer is 30-5000 c/s. total is 350,000 maxwells. Recommended crossr frequency is 2500 c/s. (The Kelly Crossr costs $11). The Mk. VII uses a lamind aluminium former with the voice coil bedded in polyester resin . . . the metal e acts as a heat sink allowing larger power puts than normal. Guitar models available at the same price. el price **$55**

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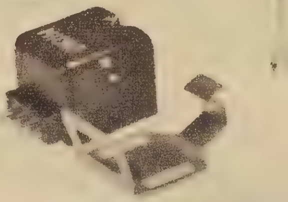

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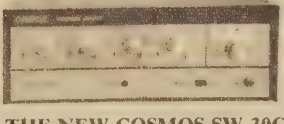

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OMMUNICATIONS SATELLITE SCHEME FOR THE PACIFIC AREA

A world-wide demand for increased facilities for international communications has focused attention on earth orbiting satellite relay stations as a means of supplementing existing cable and radio channels. An international consortium called INTELSAT with 51 member countries, including Australia, was formed in 1964 for the purpose of establishing a global satellite system for commercial telecommunications. INTELSAT already has one satellite in orbit, and two more will be launched later this year.

'he affairs of INTELSAT are ad- istered by a committee of manage- ıt which meets regularly at the con- ium's headquarters in Washington, .A. The committee consists of 15 gates representing 25 countries, and tralia, with a 2½% share of the total ital cost (estimated at $US200 mil-) for the space segment only, ex- ive of ground stations, is one of e with a seat on the management mittee.

)verseas Telecommunications Com- sion (Australia) is the Australian munications entity designated by the tralian Government for the purposes the international satellite agreements. such O.T.C. provides Australian rep- ntation at INTELSAT management etings and in the activities of various -committees—in meetings of technical financial experts for example.

NTELSAT's first practical venture in field of commercial telecommunica- s was the INTELSAT I satellite k-named "Early Bird"), which went service over the Atlantic Ocean last e, and carries communications be- en Canada and the U.S.A. on the hand and Britain and Europe on other. INTELSAT is capable of ying 240 telephone conversations ultaneously, but can also be used, n required, for trans-Atlantic relay TV programs. The satellite can also y telegraphy, high-speed data and to-telegrams (facsimile pictures).

n November, 1965, INTELSAT de- d to place contracts for further com- ication satellites and will launch of these during the latter half of year. Like INTELSAT I, they are he "synchronous" type—that is, each take exactly one day to perform one t and thus will appear to be station- above one point on the earth's sur- .

hese satellites to be known as IN- SAT II, will be an improved version he INTELSAT I. Like the earlier they will be made in the U.S.A. will be launched from Cape Ken- by a three-stage rocket of the "im- ed delta" type. When in orbit they be located 23,000 miles above the h.

nce a satellite is in orbit the gravitational effect of the sun and the moon, and irregularities in the shape of the earth, tend to make it drift out of position. To hold INTELSAT II stationary, it will carry on board tanks of hydrogen peroxide which will be jetted off from time to time to keep the satellite accurately in position.

The radio equipment carried will consist of two independent amplifiers and transponders (frequency changers). For reliability, many items will be installed in duplicate, while some particularly critical items will be carried in quadruplicate. It is expected that the satellites will receive at around 6000MHz and retransmit at around 4000MHz.

Power to operate the equipment will be provided by solar cells distributed around the outside surface of the satellite. Some 13,000 of these cells will be used, in conjunction with nickel-cadmium cells which will keep the equipment in operation when the satellite is in eclipse.

Both satellites will be located over the equator, one in the equator, one in the Atlantic Ocean area, at 6° west longitude, the other over the Pacific Ocean at 174° east longitude, which is to the north of New Zealand.

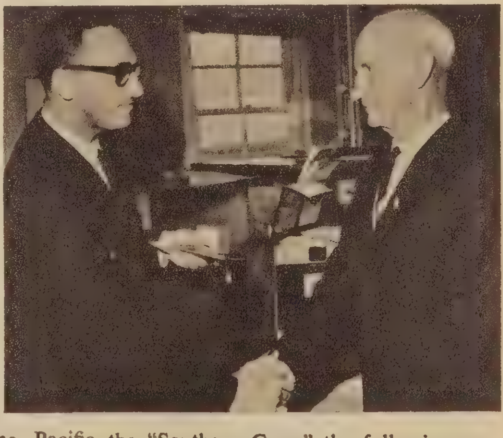
O.T.C. will initially provide service through this latter satellite via an earth station which it will establish this year near Carnarvon, Western Australia. The Carnarvon station will be a comparatively small station designed to provide support communications for the U.S. Government's APOLLO project (manned landing on the moon) and will be used for the purpose of relaying telephone conversation and data for the National Aeronautics and Space Administration (NASA) APOLLO project from Carnarvon to America. A communication and tracking station to be operated by N.A.S.A. at an adjacent site in Carnarvon will provide the actual link to the manned spacecraft.

In the Carnarvon station O.T.C. will be using a square antenna approximately 42ft across. This antenna, although adequate for the tasks for which the station is being installed, is not designed for television picture reception from satellites. The approximate cost of establishing the Carnarvon station will be about $2.5 million.

Although the primary purpose of

(Continued overleaf)

COASTAL RADIO STATION VETERAN RETIRES



One of the veterans of the Coastal Radio Service, Mr Charles Wallace, retired from the operating staff of Sydney Radio at the age of 65, to the day, on Tuesday, August 16.

In the early days of morse telegraphy skilled operators like Mr Wallace, working with primitive equipment, kept the lines of communication open and brought a measure of security to the seafarer and to the early fliers.

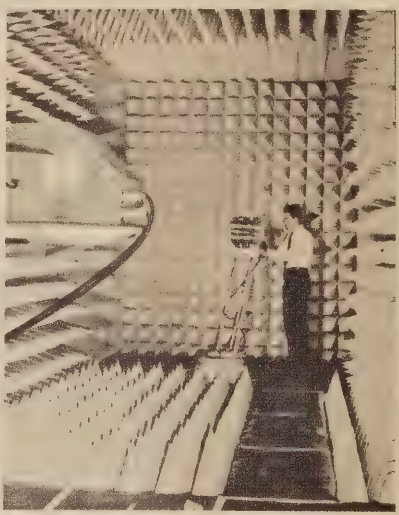
Charles Wallace was on duty with the Coastal Radio Service (at Sydney Radio) in 1928 when Sir Charles Kingsford-Smith made the historic Oakland to Brisbane Pacific crossing and personally maintained the radio watch on the "Southern Cross."

He was also on duty when Moncrieff and Hood were lost in the same year when the ill-fated Ryan went down over the Tasman Sea, and was the last man to receive signals from the "Southern Cross" the following year when the plane was forced down in the Northern Territory.

In this picture Mr Wallace is receiving his "retirement handshake," as well as a gold watch and a cheque to mark the occasion, from O.T.C. general manager Mr Harold White. ■

MOVABLE SATELLITE TRACKING STATION

A transportable ground station for an international satellite communications program arrived in Australia recently from the U.S.A., and has been erected at Cooby Creek, near Toowoomba, Queensland.



Here the radio frequency feed is being tested in an ultra-quiet chamber where spikes of foam rubber absorb sound to provide a virtually echo-less and interference free area.

The station was constructed by General Telephone and Electronics International Inc., of New York, under a $3 million contract with the United States National Aeronautics and Space Administration (NASA). Other stations participating in the research program will be located in the United States, Canada and Europe.

Mr James D. Thomson, Australian sales manager of General Telephone and Electronics International Inc., said the station was expected to be operational by October, and that, under agreement with NASA, the station would be operated by the Weapons Research Establishment of the Australian Department of Supply.

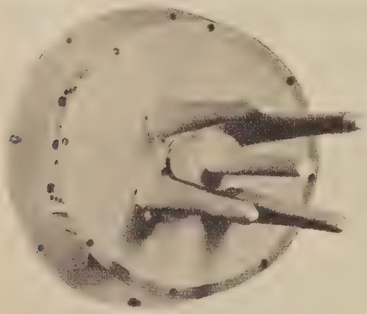
About one dozen engineers, including Australians, who would operate the station, had been trained at the United States facilities of Sylvania Electric Products Inc. a subsidiary of General Telephone and Electronics.

The Toowoomba ground station is one of three built by NASA for its Applications Technology Satellite (A.T.S.) project designed to extend the scope of spacecraft technology in communications, meteorology and scientific observation at the medium (6,000 nautical miles) and synchronous (22,300 nautical miles) orbits.

The major goal is to prove out the gravity gradient concept of spacecraft orientation at high altitude.

The project will also investigate materials research, thruster technology, altitude determination and spacecraft stabilisation. Experience gained in random multiple access will benefit the international communications satellite network.

Five spacecraft are scheduled to be launched from 1966 to 1969 in connection with the A.T.S. project. All will be placed into orbit from Cape Kennedy, Florida.



The heart of the aerial system is this radio frequency feed, designed by Sylvania Electric Products, a subsidiary of General Telephone and Electronics International. It consists of a transmitting element (centre) and four receiving elements which permit the aerial system to receive communications signals and extract radio tracking information simultaneously.

The Australian station will transmit and receive information from all five satellites. The station will perform automatic radio tracking, transmission and reception of multiplex telephone, television, and wideband data; and satellite telemetry and command information.

The heart of the aerial system is the radio frequency feed which was designed and developed by Sylvania. It consists of a transmitting element, and four receiving elements, which permit the aerial to extract radio tracking information and receive communications signals simultaneously.

Three 40ft vans house the ground station's control equipment and a major portion of the control electronics. The vans have removable walls which permit the units to be located side by side as a single unit. The telemetry and command equipment that controls the satellite is housed in a fourth van.

The station's 40ft diameter parabolic aerial can be dismantled and, with the support pedestal, transported in a flatbed trailer. A second trailer carries jacking equipment and a boom crane necessary to erect the aerial. In addition, the station includes two power vans and five house-type vans for office and maintenance facilities.

Under a separate contract, General Telephone and Electronics is developing a "counterspun" aerial for one of the satellites which will be used in the A.T.S. project. It will be mounted on a spacecraft which will revolve on its axis at 100 rotations per minute to prevent tumbling during orbit.

COMMUNICATIONS SATELLITES (cont

INTELSAT II is communications fc
the APOLLO project, it will accon
modate a number of channels (at preser
estimated at 180 telephone channel
over and above the APOLLO requir
ments, so that it will have a useful li
as a communications satellite. As wit
INTELSAT I, a large reduction of tel
phone channels from time to time woul
allow the satellite to be used for tel
vision relays. It is also worthy of no
that any single phone circuit could
used for phototelegram connection,
for more than 50 teleprinter circuits,
for a medium speed data link.

When suitable earth stations ha
been constructed, the satellites will pr
vide links between Australia and th
U.S.A., Australia and Canada, Japan an
the U.S.A.

In anticipation that the trans-Pacif
cables will be heavily loaded befo
1970 and because Australia is a sign
ficant shareholder in INTELSAT, th
O.T.C. plans to establish a commerci
earth station in eastern Australia durir
1967, and surveys are now in progre
to decide on the site to be used.

The initial capacity of this station wi
be between 50 and 100 telephon
circuits, but the planning of the static
includes provision for expansion as i
ternational requirements grow, and
the capabilities of later-generation sate
lites increase.

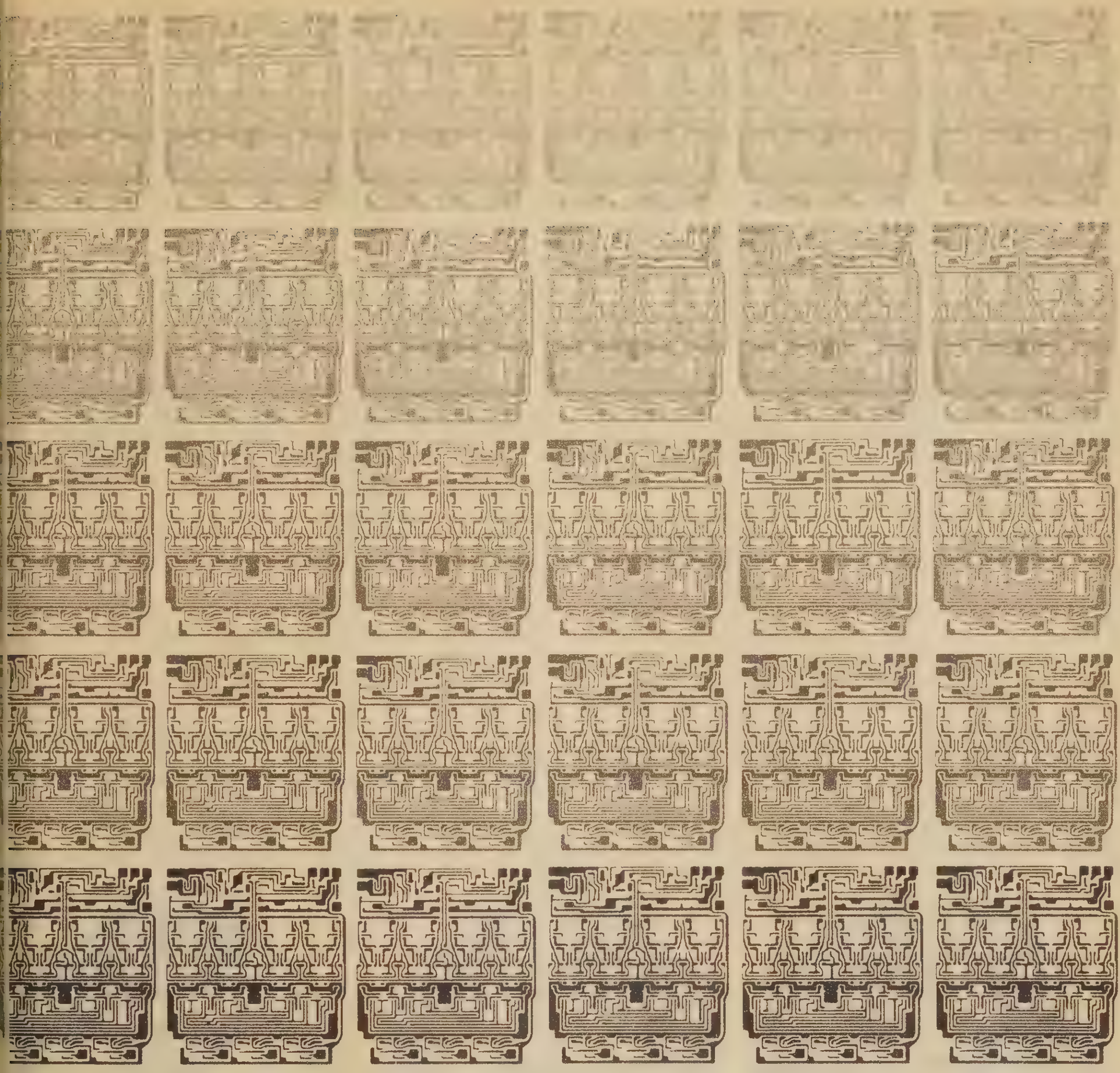
The antenna will be a large ste
structure about 100 feet high, known
a "Cassegrain" antenna. A "Cassegrai
antenna consists of a large parabol
reflecting surface (in this case about
feet to 90 feet in diameter) and
hyperbolic reflecting surface whi
work together in focusing the faint rad
waves, gathered over the area of th
parabola, into the radio receiver.
the reverse direction, the transmitt
radio frequencies will be focused into
powerful beam only 1/10° wide.

The O.T.C. radio transmitter shou
develop some 5KW of power. This w
probably be developed by a klystr
amplifier or travelling-wave tube, mou
ed on the antenna. To a large exte
the transmitter will resemble conve
tional units which have already be
in use in microwave and tropospher
scatter links throughout the world.

The receivers will be of a ty
specially designed for satellite commu
cations. A primary requirement is
extremely low inherent noise level,
cause the signals from the satellites w
be extremely weak. To achieve this lo
noise performance, each receiver will
housed in a refrigerated chamb
mounted at the rear of the aer
structure and filled with helium gas
some similar medium) at a temperat
of about 450-500°F.

Since telephone and other traffic m
eventually be fed into the G.P.O. te
phone system, a broadband landline
tension will be required between
earth station and the O.T.C. main
ternational terminal at Paddington, Sy
ney.

The next stage of development beyo
the INTELSAT II satellites has alrea
commenced with the placing of ord
for INTELSAT III satellites which
have a capacity for up to 1200 sim
taneous telephone circuits. The first
these satellites is scheduled to be plac
into orbit in the early part of 1968.



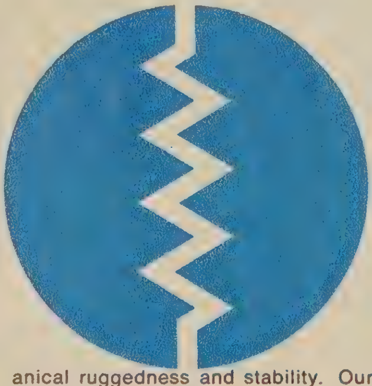
NTRODUCING TO AUSTRALIA **CORNING**
ELECTRONICS

Corning Glass Works, the world's largest specialty glass makers, have for many years produced high quality glass and a vast range of glass components for all manner of technical applications. TV tube envelopes... complex laboratory equipment...special optical glass...heat resistant glass for furnaces and missiles...and even domestic glassware. Wherever glass performs best, you'll find Corning. And now Corning is becoming one of the world's most respected names in yet another field – electronic components. In such applications as telecommunications, data processing equipment, avionics, and industrial control equipment, Corning provides specialty components that represent advanced technology and high standards of performance. This range of component is now available to Australian industry, and we are ready to discuss you needs at a senior technical level.

In the very broadest terms the rang of Corning electronic components, an those of our associates Signetics an Electrosil, are outlined below. However, complete details with data sheet are available on application.

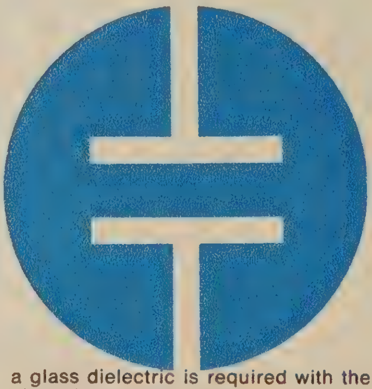
Corning Resistors

The glass tin-oxide resistor was originally developed by Corning, and is now also made by our associate company Electrosil Limited. The molecular bond between the tin-oxide film and the optical-quality glass substrate makes a resistor of unequalled mechanical ruggedness and stability. Our resistors have been proved over years of service in military, telecommunications and industrial duties in the U.S. and Europe, and are approved to both MIL and DEF specifications. Our range of over 15 different standard styles, with power ratings from $^1/_{10}$ watt to 6000 watts, shows our versatility. The Electrosil DEF5115-1 approved TR resistor, available ex stock Sydney, pioneered the concept of triple rating. The stability of the glass tin-oxide resistor is typified by the semi-precision TR style which deviates not more than 1% in 25000 hours at 70°C. Demonstrating reliability, Corning supplies resistors with documented failure rates below 0.001% per 1000 hours. And with temperature coefficients as low as 50 ppm/°C., low voltage coefficients, low noise level and non-inductive frequency characteristics, you can safely specify Corning resistors whenever you need resistors that are stable, reliable, durable and economical.



Corning Capacitors

Corning has several styles of two basic types: glass capacitors, for applications where the most stringent reliability, stability and environmental requirements occur together; and Glass-K capacitors for applications where the consistent performance of a glass dielectric is required with the size advantages of ceramic types. The stability of the first type is demonstrated by our CYFM, CYFR and TYO capacitors which show capacitance change of less than 0.5% after 2000 hours at 125°C. at 150% rated voltage. CYFM is approved to MIL-C-11272, and CYFR (the first capacitor to pass the reliability objective of the Minuteman Programme) exceeds that standard. Indeed CYFR's reliability is 0.00075% failures per 1000 hours at 100% voltage, 75°C. (90% confidence). Corning Glass-K miniature capacitors use a new high-dielectric-constant glass. An 0.1 microfarad Glass-K is just 0.25" long and 0.14" diameter. For world's best capacitor performance year in year out, for all applications, use Corning.



Integrated Circuits from Corning

Signetics Corporation, a subsidiary c Corning Glass Works, is among th world's top makers of monolithic integrated circuits, producing over 15 types for commercial, industrial, mil tary and aerospace applications. Here is our range –

* Utilogic commercial/industrial ci cuits – high capacitive drive, fan-o to 17, noise margins up to 1.2 volt

* Commercial Plug-In DTL and T circuits–monolithic dual in-line pack high reliability at minimum cost.

* Linear circuits – video, differenti and operational amplifiers; analog comparators.

* High reliability military DTL circui –the broadest field-proven DTL li available.

* Low-power aerospace circuits–op mum power, speed and noise imm nity.

* High speed TTL Avionic circuits gate delays under 10 ns, fan-out up 10, high capacitive drive, 1 volt typic noise margin.

Signetics circuits available ex sto Sydney. Contact us for a catalog brochures, or any details.

Corning Fluidic Devices

Fluidic devices, developed by Corning, bring to hydraulic and pneumatic systems refinements which were previously available only in electronics systems–logic functions, sensing, amplifiers, etc. Corning can supply both digital fluidic devices (such as gates and flip-flops), and analogue devices in which the output varies directly with the input in terms of pressure and flow conditions. These devices are made with Fotoceram, a Corning ceramic material, which allows the necessary dimensional accuracy to be attained in a high-strength, solvent-resistant, wide temperature-range material.

Corning can supply these components:– Amplifiers, OR/NOR Gates, AND Gates, Flip-Flops, Binary Counters, Schmitt Triggers, Timers, Resistors, and Pressure-to-electric switches. You can make up complete fluidic systems from these components, or Corning can produce the complete system as an integrated circuit in a single Fotoceram block.

Corning Delay Lines

Our ultrasonic delay lines are made either with low-loss fused silica or zero-temperature-coefficient glass.

Corning "Glass Memories", our high-speed delay lines for digital storage, offer * Storage up to 25000 bits (RZ) * Bit rates from 1 to 50 Mb/s at average access times 0.5 to 500 microseconds. * Low signal loss.

Corning also can supply non-digital delay lines for radar, colour T.V., and other analogue storage applications. These can be supplied for CW and pulsed CW operation at frequencies from 1 to 60 MHz, and delay times from 1 to 5000 microseconds.

Corning Materials for Electronics

Corning Glass Works is the largest producer of technical and specialty glass in the world, and has long been established as a major supplier of glass for electronic applications. Our Liverpool, N.S.W., plant has made bulbs for the picture tube industry in Australia for several years.

Among the materials we supply are:– *T.V. Picture Tube Envelopes. * Valve envelopes. * Tubing and Cane. * 'Multiform' and 'Clearform' beads. * Ground and Screened glasses. * Getters. * Microcircuit substrates and packages. * Fibre optics.

CORNING
ELECTRONICS

Corning Glass Works (Inc. in U.S.A.)
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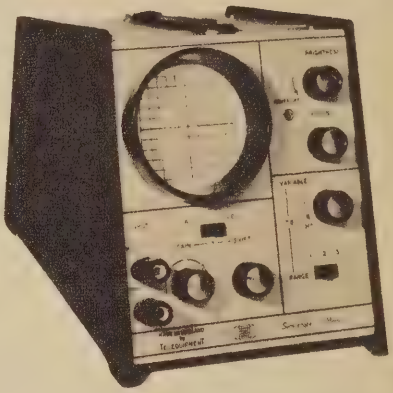
TELEQUIPMENT

Serviscope Minor

Completely new — low priced _ simple to use



The Serviscope Minor is a completely new, low priced, simple oscilloscope which has been developed especially for use in schools for the teaching of modern physics. The requirement for a small, easy-to-operate, inexpensive and robust instrument for pupil use has been met in the following ways:

TIME BASE: This locks automatically thus overcoming the most difficult operational problem. Other controls have been reduced to a minimum.

LOW PRICE. This has been achieved by skilful design which has kept the size comparable with a transistor set.

RUGGEDNESS. Printed circuits and exterior finish of durable plastic have ensured this most desirable characteristic.

The Serviscope Minor is capable of the visual presentation of results in many experiments in the teaching of basic physics including mechanical, acoustic, DC, AC quantities, etc. In addition, by virtue of its small size and low price this oscilloscope has many applications in servicing, hi-fi, recording, etc., where a basic general purpose 'scope is required.

SPECIFICATIONS

Cathode Ray Tube:

A 2¾'' CRT operated at 600V provides a bright fine trace. The green removable graticule is divided into 10 divisions, both horizontally and vertically, each division being 0.5cms. A moulded rubber light hood is fitted as standard.

"Y" Amplifier:

The direct coupled vertical amplifier has a a bandwidth of 30Kc/s (-3db) and has continuously variable gain control providing a sensitivity range better than 100mV/division to 50 V/division.

Floating Input:

The input terminals are fully insulated from case and ground.

Time Base:

The time base is automatically triggered by any input signal of more than half division thus eliminating synchronising/triggering controls. Time base speeds can be varied from approximately 100uSecs/division to 100mSecs/division by a 3-position switch with a variable control to provide continuous overlap between ranges. The time base may be switched off, when the undeflected spot will return to the screen centre.

Size and Weight:

The Minor is extremely portable, (5 lbs., only) with dimensions of 5¾'' wide x 6'' high x 9'' deep.

Power Supply:

The instrument is suitable for operation from 200/250V AC 50c/s supply. "Power On" warning light is fitted. Power consumption is approximately 25 W.

PRICES: $100.00 FOR/FOB Sydney

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Technical Review

SCANNING MICROSCOPE USES TV TECHNIQUES

One of the limitations of conventional optical microscopes and the modern electron microscopes, lack of depth of field, is overcome with a new type of scanning electron microscope. The instrument was described briefly in our June issue, but this more detailed report has since come to hand.

By Luscombe Whyte

The instrument, called the Stereoscan nning electron microscope, uses tele- ion techniques to give results un- tainable with optical or standard elec- n microscopes. The makers, Cam- dge Instrument Company Ltd., of Lon- n, say it is the only commercial in- ument of its kind made in Europe d the only scanning microscope in world to be designed specifically large-scale production. It has aroused nsiderable interest since it was intro- ced last year, and models are already rking in Europe and America.

The microscope has more than 20 nes the resolving power of the best tical instrument and its depth of field at least 300 times as great. It has range of magnification variable be- een 50 and 220,000 times. Unlike conventional "transmission" elec- n microscope, which produces an im- by shooting electrons through ultra- n specimens, the scanning microscope lds surface images of comparative- large and thick specimens. These ear as high-definition pictures on a hode-ray tube.

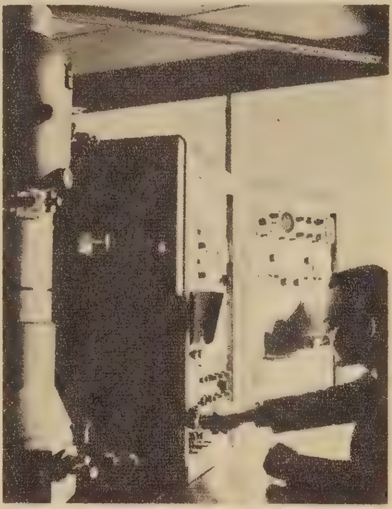
lear images result even from rough d indented specimens — such as skin h hair, parts of insects and other logical and entomological subjects, es, jagged fractures in ceramics, bone metal, the interior of holes and even gmented or powdered materials. Hairy wths, flaking or disintegrating sub- nces and those with rough, undercut faces can be successfully examined ler high magnification.

ven at low magnifications, the new rument's enormously greater depth field is an advantage not possessed optical instruments normally used h such specimens. Comparative rographs demonstrate this vividly. optical image shows sharply only hin stratum of a rough specimen, inst a blurred foreground and back- und. The scanning image presents both peaks and valleys in sharp detail. The transmission electron microscope cannot examine such specimens directly.

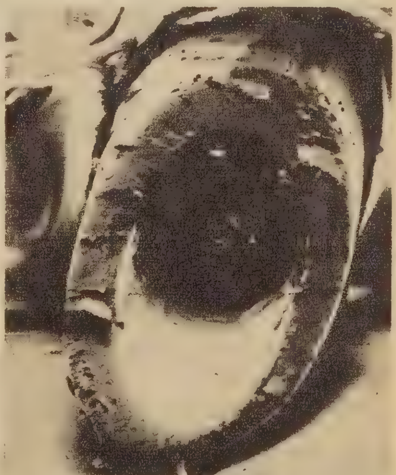
Potential applications for the Stereoscan are wide. It is said to offer a completely new investigational tool for the chemist, physicist, biologist, metallurgist and electronic engineer. Its uses in many sectors of medicine are being explored. Although it makes no claim to supersede optical and transmission electron types, it can be regarded as complementing both of these, filling the gap between them and greatly extending the range of possible microscopic investigations.

Basic principles of both types of electron microscope were understood in the 1930s, when the growing demand for higher magnifications led to research in several countries. The optical microscope —limited by the wavelength of light— had nearly reached its fundamental optimum. It could observe objects measuring 5,000 Angstrom units (one Angstrom equals one ten-millionth of a millimetre) but none smaller. For greater magnification a means of illumination of shorter wavelength than that of visible light was needed. The ultraviolet microscope, which gave detail down to 2,000 Angstroms, was evolved, but its invisible image had to be photographed or transformed into a sort of television picture by special apparatus before it could be studied.

The discovery that electrons — when accelerated to high velocity — behaved as though they had "wavelengths" of well under one Angstrom, and that they could be focused like light, led to the first transmission electron microscope. Thousands of these, improved to give magnifications of 250,000-1,000,000, are now in use throughout the world. They are valuable tools in many fields but are unable to examine directly the micro-topography of solid specimens. In addition, to avoid heavy energy losses



The Stereoscan electron microscope, showing the electron-optical column and display racks.



This application micrograph obtained from the Stereoscan electron microscope illustrates the extreme depth of field obtainable with the instrument. It is actually the tip of a hypodermic needle, and the adhering debris is particles of skin and flesh.

AWA
7 watt transistor amplifier

7 watt all-transistor amplifier

(AC or Battery operated)

Smartly Styled Model PA746

This amplifier is a 240 volt AC unit or a portable battery powered unit for speech and music amplification. 12 volt DC operation makes the amplifier highly suitable for all types of mobile address work. The unit also operates from a 6 volt DC supply with a corresponding reduction in audio output. The attractive case is in sturdy black armorette with polished chrome trim.

Input and output facilities

Input and output facilities are as follows: **1.** Crystal Microphone input, .4 megohms. **2.** Dynamic Microphone input, low impedance. **3.** Pick-up input, .5 megohms. **4.** Output taps are provided at impedances of 600 ohms, 200 ohms and 100 ohms.

Amplifier performance

1. Sensitivity: On pick-up approximately .5V for full output. On microphone approximately 2mV for full output.

2. Frequency Response: With tone control at normal, response is substantially level from 50 cycles to 10 Kc.

3. Harmonic Content: Less than 5% at full output.

4. Noise Level: Pick-up input better than -60db bel full output. Microphone input better than -30db bel full output.

5. Tone Control: Operative on pick-up channel onl Gives a smooth cut to top frequencies with a full cut -22db at 10 Kc in maximum clockwise position.

6. Power Consumption: 12 volt operation — appro mately 1.35 amps. at full load condition, quiescent cu rent 150 MA. 6 volt operation—1.2 amps. at full lo condition, quiescent current 200 MA.

Specifications

CONNECTIONS

Mains connection by plug-in power cable. Battery c nection by plug-in battery cable. 6V or 12V battery sel tion by screwdriver switch at rear.

TRANSISTORS

Microphone Preamps.	2N217	(2)
Main Amplifiers	2N217	(2)
Push-pull Drivers	2N270	(2)
Push-pull Output	2N301	(2)
B- supply Diode Rectifiers	1N1199A	(2)

DIMENSIO

Width	5
Height	7
Length	13
Wt.	19 l

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scattering of electrons. specimens e first to be cut to extreme thinness about 100 Angstroms in some cases). hly sensitive slicing machines. called a-microtomes, are needed and speci- ns must be specially prepared be- ehand and handled with great care en cut.

he first experimental scanning elec- n microscope was built more than 2 years ago but little progress was de towards a practical instrument il Professor C. W. Oatley and co- kers at the University of Cambridge an a research program in 1948. This k has continued ever since. The emely practical Stereoscan has been eloped largely from this research and y be still further modified in the light continuing research, should this prove irable.

he Stereoscan makes use of electron bes to "feel" the surface of a speci- n — electrons from a heated tung- n-filament electron gun are accelera- into a high-velocity beam by volt- s variable from one to 20KV. In- e the air-exhausted vertical pillar of microscope, this beam is focused a series of electro-magnetic lenses a fine probe. Horizontal and ver- l deflection coils cause the probe to n the specimen, as in television tech- ue.

he impact of this electron probe on specimen liberates low-energy secon- y electrons from the surface. Their nber and energy depend largely on character of each area examined. erated electrons are collected by a ntillator-photomultiplier system. The ulting signals are used to modulate brightness of a synchronised scan- g beam in the display cathode-ray e. The result is, in effect, a magni- television picture of the specimen the tube's screen. Image contrast ends upon the varying numbers of ctrons emitted from different parts of specimen.

agnification is determined by the o between the lengths of line scanned the display tube and on the specimen pectively. It can be changed at will hout refocusing the probe. The maxi- m range of magnification is between and 220,000 times, but in normal the range does not usually exceed ut 30,000—many more times than is sible with an optical microscope.

It would appear that the extreme th of field is due to the essentially rallel" nature of the electron beam, ibutable in part to its velocity and part to the electron lenses which trol it. Because the beam neither verges nor diverges it will scan the e unit area over the whole of the cimen, regardless of irregularities in surface which vary the distance over ch the beam has to travel.—Editor, ECTRONICS Australia.)

he Stereoscan apparatus consists of basic assemblies — the electron- ical column and the display panels. third unit for the power display is sed some distance away so as to uce the magnetic field near the instru- nt. Modular, plug-in components are d as much as possible, which means t the whole apparatus can readily be pted for specialised work. The micro- pe itself is the vertical electron-optical umn, with the electron gun at the , three electro-magnetic lenses in the body and a large specimen chamber at the base. It is mounted on a cabinet holding the vacuum pumps which are needed before use.

Specimens up to 12mm. in diameter and 3mm. thick can be clamped on to the specimen stage, which can be rotated and moved in several directions by external controls. No preliminary treatment is needed for most specimens though—for top-resolution pictures — a thin coating of evaporated gold or gold-palladium is an advantage when examining insulating materials. However, when using reduced accelerating voltages, good pictures of completely untreated insulating specimens, such as wool fibres, can be taken. There is little risk of damage, even to delicate specimens, because of the low energy dissipated by the scanning beam.

The electron-optical column and specimen chamber are both evacuated by fast vacuum pumps before operations. The specimen chamber has its own isolating air valves, so that specimens can be changed without affecting the vacuum in the main column. Time required to pump down again after a change is only about two minutes. The whole system of air valves and electrical switches is interlocked for safety and can be set to operate automatically in the right sequence.

Magnified images are presented on two cathode-ray tube screens, housed in the display panel, each with a useful area of 10.5 sq. cm. The visual observation screen has a resolution of better than 500 lines and the recording screen of about 800 lines, giving well-defined pictures. The recording screen normally has a camera mounted before it, which can be of two interchangeable types, a normal 35mm. camera or larger Polaroid type.

Pictures are extremely lifelike, without foreshortening or severe shadowing, and need no skilled interpretation, as do some transmission-micrographs. Even more detailed examination of rough surfaces is possible by using two-exposure stereo-micrographic techniques.

The new microscope is now being evaluated in many sectors of industry and research. New applications, originally unforeseen, have been explored. Among these is the use of scanning microscopy in the electronics industry for examining transistors and other miniature components. Not only does the instrument present clear topographical images, but it can also differentiate between areas at different electrical potentials. Surface potential differences are clearly shown on the display screen as differences in contrast, over and above the normal topographical differences.

Research workers at the University of North Wales' School of Engineering Science have been developing this technique. They have found it possible to follow under the microscope the functioning—or malfunctioning—of transistors as the voltages on the electrodes are altered. The positions of electrical or structural faults, not otherwise easily detectable, are readily located and eventual breakdowns may often be predicted. ■

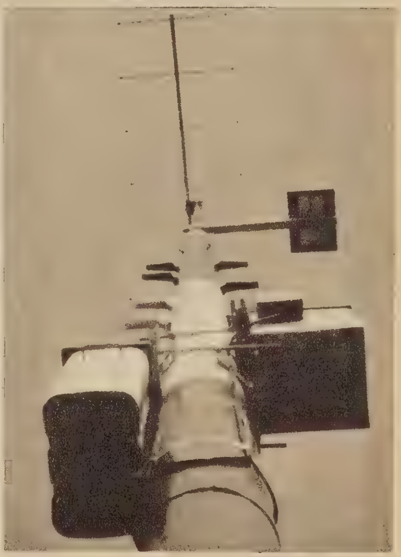
SUN-POWERED RADIOPHONES FOR MOTORWAY EMERGENCY

A sun-powered telephone system, designed specially for motorway emergency call boxes, has been installed to cover 12 miles of a new motorway between Accra and Tema, in Ghana. Known as "Suncall," this development by AT&E (Bridgenorth) Limited—part of the Plessey Electronics Group—shows a substantial saving on capital and installation costs compared with conventional methods and is believed to be the first application of solar energy to a motorway emergency telephone system. The system is based on a fully transistorised radiotelephone.

On the Ghana motorway the system comprises five pairs of telephone boxes, each pair being situated at a two-mile interval, one each side of the carriageway. These give access to the Accra terminal toll booth, which is also connected by AT&E type 700 radio on the Tema toll both—12 miles away—to a separate exclusive telephone link. The roadside stations are all powered by solar energy converters, the radio power output on this system being approximately 1/3W.

A motorist in trouble can make contact with a toll booth or section control booth point by simply opening a call box and lifting the telephone handset. During the conversation any other station attempting to call is "busied out" and therefore cannot interfere with the call until it is completed. The toll booth or controller does not need to call a motorway box and therefore this facility has not been provided.

The radio equipment is hermetically sealed, weather protected and mounted on or close to an aerial pole adjacent to a standard motorway booth.



The 40ft tubular mast shown carries a directional aerial (top), a solar cell panel (upper right), a weatherproof box housing batteries and charge regulator (lower right), and the fully transistorised radio terminal (lower left). A second telephone booth on the opposite carriageway is connected in parallel with the radio-controlled booth by a verminproof cable under the carriageway. ("Engineering," 24/6/66.) ■

NPN SILICON PLANAR

Everything about the Anodeon transistor is right—quality, characteristics and ratings in particular. These Australian-made, hermetically sealed metal TO-1 case transistors are designed for longer life under severe conditions in all low to medium power consumer, industrial and professional applications. Don't say "Transistor" without saying Anodeon first!

TYPE	BVCBO Volts	BVCEO Volts	BVEBO Volts	IC Max. mA	PC Max. mW	fT. MHz	hFE @ 2mA		NF @ 1MHz		PRICES $ PER HUNDRED	
							Min.	Max.	db Typ.	db Max.	1.99	100-499
AT310 G.P. Audio	45	30	5	30	200	230	40	—	—	—	$75.00	$43.50
AT311 Conv. i.f. amp.	45	30	5	30	200	230	40	160	—	—	$75.00	$44.95
AT312 Conv. i.f. amp.	45	30	5	30	200	230	100	400	—	—	$77.50	$44.95
AT313 Lo. noise r.f.	35	20	5	30	200	230	20	180	4	5.5	$80.00	$46.40
AT314 G.P. Audio	35	20	5	30	200	230	40	—	—	—	$72.50	$42.05
AT315 Conv. i.f. amp.	35	20	5	30	200	230	40	160	—	—	$75.00	$43.50
AT316 Conv. i.f. amp.	35	20	5	30	200	230	100	400	—	—	$75.00	$43.50

Full data from

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DIVISION OF ELECTRONICS INDUSTRIES LIMITED

RANSLATION OF TECHNICAL ARTICLES BY MACHINE

The possibility of substituting a machine for a human in the process of translating printed literature in one natural language into its meaning equivalent in another language was first mooted when the first electronic digital computers were being constructed in the late 1940s.

by John McDaniel, B.Sc. (Eng) S.M. *

was realised, that these machines, g the ability to perform sequences ded instruction on numerical data eat speed and with high reliability, d, if properly instructed, be able to human translation processes on rically coded literature.

first the problem of how to instruct l computers to translate was attrac- nly as an academic exercise, but it ince then gained much more prac- and economic importance with the ing need for the international ex- ge of published scientific information e made more comprehensive and immediate.

e translation part of this exchange l be met by only a few electronic uters per country to cope with the lation of information published in ages foreign to that country, and would be perhaps a hundred times er than the alternative, a host of n translators.

e U.S.A. was the first country to de- a large research effort to the study achine translation, and work was ntrated on translation from Rus- to English.

e U.S.S.R. followed soon after with s of many more languages than .S.A. Now, outside of the U.S.S.R., are some 20 or so research pro- in machine translation in six coun- with Russian still receiving most at- n as the source language. All pro- so far have restricted their studies anslation between one pair of lan- s. Only theoretical consideration een given to the problem of uni- l translation between any pair of ages.

search on machine translation .) was started at the National Physi- aboratory, England, in 1959. From utset, studies have been restricted to ranslation of Russian scientific and ical literature into English.

e computer being used in the experi- s is the ACE computer, designed onstructed by N.P.L. staff. It must nphasised that research on M.T. so as revealed no requirement on the hine" being used that cannot be by most current large electronic l computers.

ch computers need no special adap- for doing M.T. and can immediately switch to mathematical computations or business data-processing problems when not engaged on M.T. Assuming that M.T. will be proven to be feasible, then any large digital computer establishment could produce programs to do M.T. on its machine.

The first requisite in any M.T. program is an automatic machine dictionary. This is directly analagous to the familiar printed dictionary in that it is an ordered list of words of the source language (assumed to be Russian for the rest of this article) with, for each word, a grammatical description and the equivalent word or words in the target language (English in the N.P.L. project). Naturally the M.T. dictionary has to be made available in a form that the computer can deal with, usually by recording it in numerical code on magnetic tape.

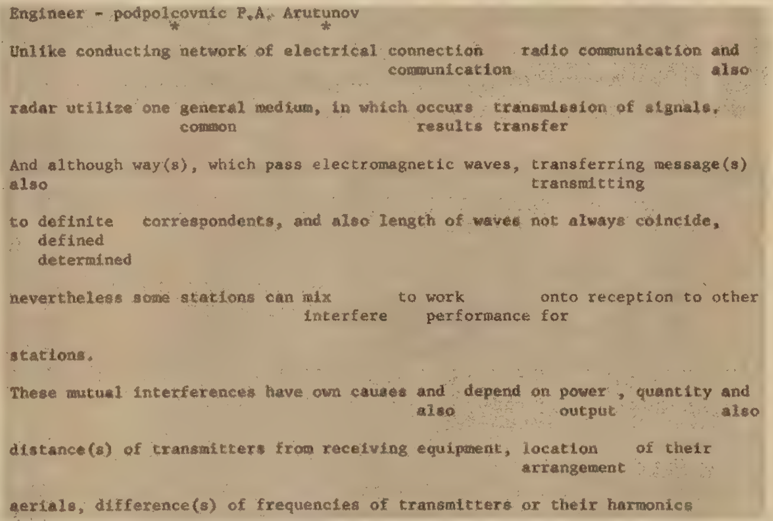
The dictionary at N.P.L. has about 15,000 entries and is stored on two reels of tape. The words of the dictionary have been selected particularly to cover the literature of mathematics, physics and electrical engineering. Russian being a highly inflected language, most words have many different inflected forms depending on their particular function in given sentences. Considerable economy in the size of the N.P.L. dictionary has been achieved by having, in most cases, all variant forms of a word referred to one dictionary entry, which entry represents the morphological stem of that word.

This is in contrast to another form of dictionary organisation in which all forms of words have separate, distinct entries representing them in the dictionary.

The NPL dictionary is used to "look-up" batches of several thousands of Russian text words entered into the computer via punched cards. Comparison of individual words with the dictionary, in the order in which they occur in text, would involve much wasted time, with the computer skipping over large sections of tape to get to the matching entries. Putting many text words into dictionary order before they are looked up means that they can all be matched in one continuous scan through the tapes of the dictionary. The words are then sorted back into original text order.

The very crude pidgin English that would be the result of the straightforward dictionary look-up stage of M.T. can only be the first step towards a practically usable output translation. The next step, syntactic analysis of Russian sentences and transformation into conventional English syntax, has also been studied at the N.P.L. Basically, our policy has been to develop programs which look for certain, fairly simple, syntactic features and to transform these, locally as it were, into their equivalent, or approximately so, English syntactic features.

This is in marked contrast to the more complex approach, adopted by most other research groups, of attempting to detail the whole structure of a Russian sentence before beginning its transformation into an equivalent English sentence. ("Electronics Weekly," June 29, 1966.)



```
Engineer - podpolcovnic P.A. Arutunov
                  *                *

Unlike conducting network of electrical connection   radio communication and
                                        communication                    also

radar utilize one general medium, in which occurs  transmission of signals,
                  common                       results transfer

And although way(s), which pass electromagnetic waves, transferring message(s)
also                                                   transmitting

to definite   correspondents, and also length of waves not always coincide,
   defined
   determined

nevertheless some stations can mix       to work        onto reception to other
                                 interfere    performance for

stations.

These mutual interferences have own causes and  depend on power , quantity and
                                           also          output              also

distance(s) of transmitters from receiving equipment, location    of their
                                                      arrangement

aerials, difference(s) of frequencies of transmitters or their harmonics
```

Example of machine translation. The short lists of words are alternatives from which the reader must choose, and asterisked words were not in the dictionary so were transliterated.

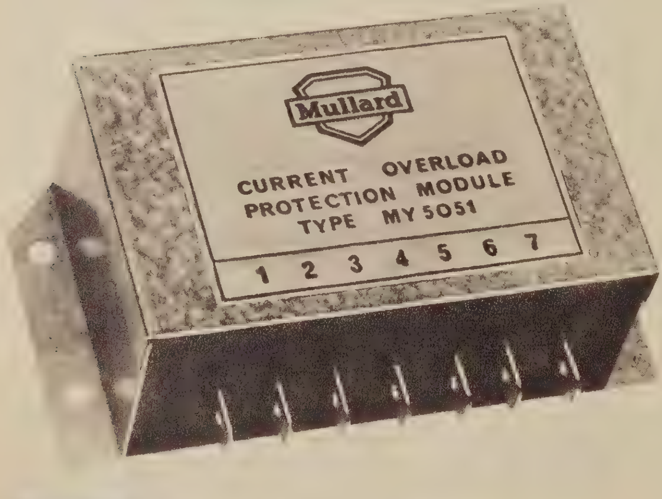
---

cipal Scientific Officer of the auto- cs division, National Physical ratory.

THYRISTOR FIRING MODULES

Some typical applications of the new and improved methods of power control made possible by thyristors are DC motors, electric furnaces and lamp control. For satisfactory operation of thyristors in terms of reliability and performance, it is important that triggering be achieved by circuit designs which take into account environmental conditions experienced in power control systems. Mullard trigger modules —sealed assemblies of components—do just this.

A typical Mullard thyristor firing module



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MODULE TYPE MY5000

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thyristors in single phase power co
trol circuits.

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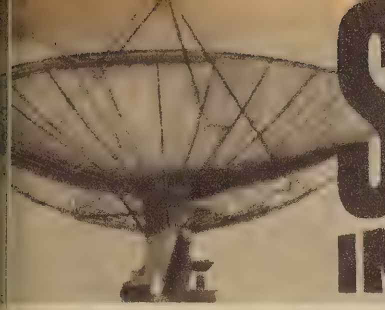
Suitable for triggering up to four th
ristors in single phase power cont
circuits, the MY5011 can accept t
signal inputs from current or volta
sources.

MODULE TYPE MY505

A current overload and surge s
pression module designed to w
with the MY5000/1 thyristor trig
module in power control systems.

Comprehensive data sheets a
descriptive literature for th
modules are available on applica
to the Mullard Industrial Control
Instrumentation Divisions.



SCIENTIFIC AND INDUSTRIAL NEWS

ondon-Canberra computer link

An Australian computer based on Canberra was used by an ternational working party of communications engineers, meeting London during August, to solve problems within 24 hours hich otherwise would have taken months to solve. The com- iter, in Canberra, was made available by the C.S.I.R.O. to the verseas Telecommunications Commission (Australia) who pro- ammed it for the purposes of the London meeting.

Technical representatives of O.T.C. and its partners in the ommonwealth telephone cable system meet from time to time advance the forward planning of that system. The meeting London during August was part of that process, which has come substantially more complex with the imminent addition the network of intercontinental satellite communications rcuits. For some time O.T.C. has been developing a computer ogram to aid the work. The availability of this program and a suitable computer in Canberra enabled the meeting in ondon, using the normal international telex service, to test e capacity and grade of service of between 40 and 50 ternative possible networks.

This is the first known occasion on which an international eeting of this kind has systematically, throughout its delibera- ons, interrogated a computer, let alone one at the other side the world.

The Australian representatives at the London meeting were r R. R. Long, O.T.C.'s assistant general manager (technical) d Mr D. M. Charrett, an O.T.C. senior engineer. The ustralian end of the operation was supervised at Canberra an O.T.C. planning engineer, Mr W. W. Donald.

.T.C. radio links for Mexico

Standard Telephones and Cables Pty. Limited has received o major Mexican orders for radio link equipment valued at ore than $US330,000. The equipment—fully transistorised 000MHz radio link relay systems which can provide up to 0 telephone channels—has been bought by the Mexican tele- hone company, Telephonos de Mexico, principally to accom- odate the increased telephone traffic brought about by the urist influx, and also as a preparation for the Olympic Games 1968.

One of the radio link telephone networks will run between e cities of Monterey and Matamoros, a distance of 180 miles; second and smaller system will run between Mexico City and uernavaca, a distance of 60 miles.

The Monterey-Matamoros network is actually a three-city nk, the first section being between Monterey and Reynosa, pproximately half way along the route.

The two contracts for the Mexican telephone networks were on by S.T.C. against stiff competition from French, American nd English telecommunications' companies.

Mobile radio for ambulances

Standardisation of mobile radiotelephony for New South Vales country ambulance services has been advanced a further age with the installation of a new two-way radiotelephone system for the Manning District Ambulance Service. With this latest installation, there are now 40 ambulance services in New South Wales using mobile radiotelephone equipment made and supplied by Amalgamated Wireless (Australasia) Limited. These operate through 68 base stations to more than 380 ambulance cars.

Action to achieve radio co-ordination, using a common frequency and method of transmission to allow reciprocal communication facilities throughout the New South Wales ambulance network, was recommended by the N.S.W. Ambulance Transport Board to country ambulance services. This followed consultations with the Postmaster-General's Department. When the country co-ordination scheme has been completed, there will be intercommunication between ambulances operating in all parts of New South Wales.

In the metropolitan Central District Ambulance radiotelephone system, standardisation of which was completed in 1963, there is provision for radio-terminal facilities for co-ordinated country ambulance services, a monitor receiver maintaining continuous watch on the country ambulance frequency. The Central District Ambulance base station at Sydney's Central Railway Station is capable of being switched to that frequency for communication with country ambulances approaching Sydney.

No help for Australian inventors

At a recent meeting of the Inventors' Association of Australia, The Hon. L. J. Reynolds, M.H.R., referred to the lack of assistance accorded to inventors in Australia by the Government compared with some overseas countries.

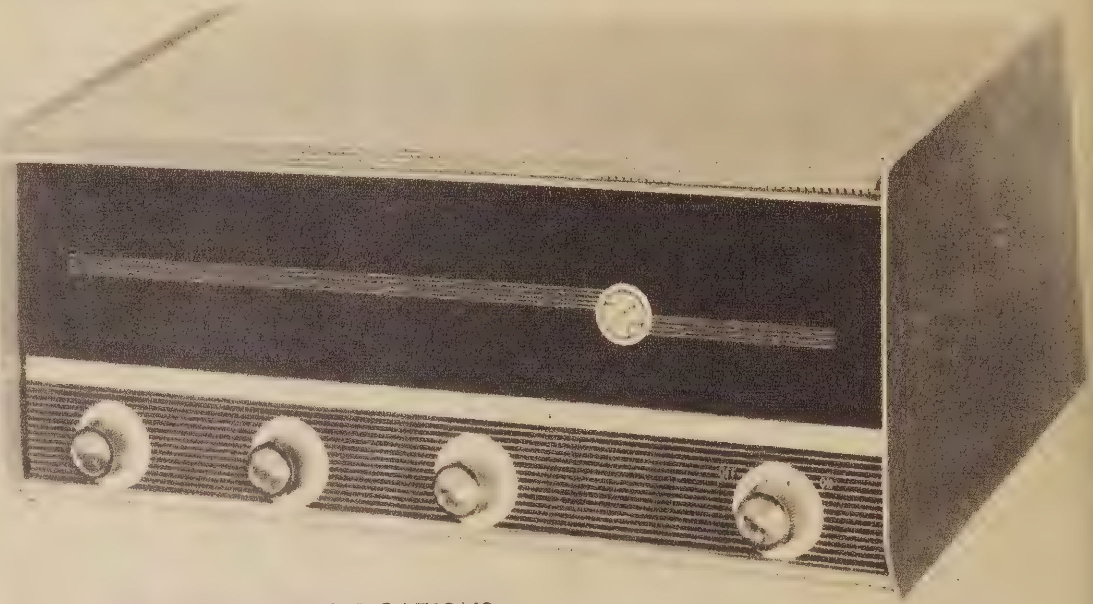
In Britain, after the matter had been debated in Parliament, the Government had decided to make £5m. available to inventors in one year to assist them to realise their inventions, and had been so pleased with the results that they had increased

New data recording equipment designed to speed up computerised costing operations in factories is seen here in use in a Melbourne factory. It is being marketed by Communications Systems of Australia, and the makers claim it will eliminate the bottleneck caused by double handling of costing information—once when it is manually recorded and again when it is converted into machine language. The new equipment consists of a time punch and a micro punch. The time punch acts as a job recorder and punches start and stop items on standard 80-column cards, identified by job number. The employee punches the "start" end when he begins a job and the "stop" end when he finishes. The micro punch is used to add variable data to the cards. The finished card can be processed by card tabulating equipment to provide a job analysis.

Public Address Amplifiers

Models PA 35 and PA 65

These amplifiers are intended to cover a large range of requirements where reinforcement of speech and/or music is required. They are eminently suitable for installation in clubs, conference rooms, restaurants, hotels, etc.



TECHNICAL SPECIFICATIONS

	PA 35	PA 65
Nominal power	35 watts	65 watts
Peak power	40 watts	70 watts
Microphone sens.	3MV (100K ohms)	As PA 35
Pickup sens	125MV (1 megohm)	"
Tone control	Minus 20DB at 10KC	"
Response	30-17,000 CPS + 3DB	"
Noise	Minus 60 DB	"
Inputs	1 microphone/ 1 pickup	"
Provision for	50 ohm Input	"
Output impedance	100V Line (330 ohms)	"
Regulation	3 DB	"
Valves	Two 12Ax7 Two 6DQ6B	"
Rectifier	5 x IN3194 Silicon Diodes	" As PA35
Fuse	2 amp.	2 amp.
Dimensions	16" x 9½" x 6½"	As PA 35
Gross Weight	21 lb.	21 lb.

PA 35 $117.25
£58/12/6

PA 65 $138.60
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Price Retail Plus Sales Tax

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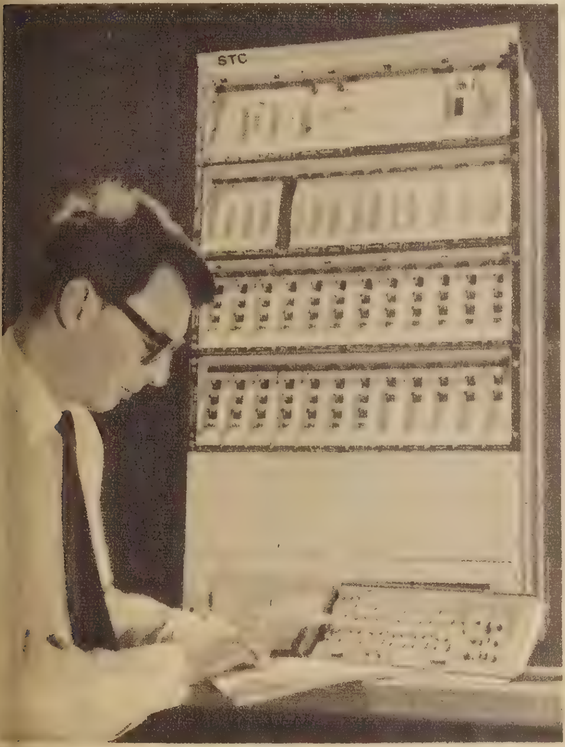
N.S.W.: Jacoby, Mitchell & Co., 469-475 Kent St., SYDNEY.
TAS.: Homecrafts-Tasmania, 199 Collins St., HOBART.
Nichols Radio, 91 Wellington St., LAUNCESTON.
QLD.: T. H. Martin Pty. Ltd., 35 Charlotte St., BRISBANE.
N.Z.: P. H. Rothchild, 83 Pretoria St., LOWER HUTT.

; amount to £10m. in the following year. Despite changes government, the grant had been renewed each year, and last ır was increased to £25m. These funds were controlled by National Research and Development Corporation, which ne into existence in 1948.

Mr Reynolds pointed out that there was no comparable dy in Australia, and talented but struggling Australian inventors served some support from the Government. In Britain, the R.D.C. has assisted in the development of such projects as Hovercraft, computers, inflatable liquid-carrying barges, dicines and medical equipment and much electronic equipment. ıstralia was paying out about $50m a year for patents valties, and part of this money could be used to assist ıstralian inventors.

The Australian Inventors' Association meets on the first iday of each month in Philips House, 69-79 Clarence Street, dney. Further information can be obtained from the Secretary, r S. E. Shrivell, 98 Ramsgate Road, Sans Souci, N.S.W., one 529-8135.



To increase the capacity of existing underground telephone cables, the Post Office in Britain will install a 24-channel pulse code modulation system developed by General Electric Co. (Telecommunications) Ltd. and Standard Telephones and Cables Ltd. The system will provide additional telephone circuits between central London and a number of suburban exchanges, and will also be used for telephone networks in other parts of the country. Here, an engineer is seen testing multiplex terminal equipment for the new system.

xport orders for Plessey

The Plessey Group in Australia earned export income worth ore than $1,400,000 in the year ended June 30, 1966, said e chief executive of Plessey Pacific Pty. Ltd., Mr George oust. Commenting on this figure, Mr Doust said that it was e highest achieved by the local Plessey Group since its tablishment four years ago, but the organisation expected to even better this financial year.

Member companies of the Australian group had developed orthwhile markets in New Zealand, Hong Kong, Taiwan and alyasia, and the Asian sales had been made against strong mpetition from Japanese and European suppliers. Products sold Asia included telephone subscriber message registers, drum nouncing equipment, portable tape recorders and electronic mponents. Plessey was going all out to expand its Asian tlets and would participate in the First Asian International rade Fair to be held in Bangkok at the end of this year, Ir Doust continued.

He said that postal administrations all over the world were modernising their mail handling services, and were showing considerable interest in the new automatic mail handling systems developed by Telephone and Electrical Industries, a member of the Plessey Telecommunications division in Australia. The equipment was being installed in the new mail handling centre of the Post Office at Redfern, N.S.W.

Electronic vehicle detector

A traffic actuated signal incorporating the latest version of an electronic vehicle detector made by Amalgamated Wireless (Australasia) Ltd. is now in operation in Maitland, N.S.W. This is the first signal of this type to be installed in N.S.W. outside Sydney, Newcastle and Wollongong, but similar installations are planned for Albury, Wagga, Tamworth, Lithgow and Orange.

The new detector requires only a loop of wire buried about one inch below the roadway to detect and signal to the automatic controller the approach of vehicles towards an intersection. The detector produces a "signal" when each motor vehicle passes over the loop and another version of it provides a constant "signal" when a stationary vehicle is within the field of influence of its loop.

This new transistorised detector and modern electronic controller combine to make the signals now being installed in New South Wales among the most flexible and versatile in the world, AWA claims.

Technical conference in Sydney

A two-day Communications Conference held in Sydney by the Electrical and Electronics Board of the Institution of Engineers, Australia, August 24-25, was officially opened by the Postmaster-General, Mr Alan Hulme.

Nearly 100 members attended, representing 50 separate organisations, including Commonwealth and State Departments, the Armed Services, Universities, manufacturers and equipment suppliers. The 14 technical papers presented included 10 on radio and television matters.

The Electrical and Electronics Board was set up on an Australia-wide basis last year. It comprises 23 members from all States, including two senior Post Office engineers and one from the O.T.C. The Conference was the first of a series to be held annually by the Board on selected engineering topics.

Small atomic batteries

Miniature atomic batteries whose energy comes from the emission of radiation by radioactive materials are now practical devices with applications for shipping, meteorology, communications, medicine and other purposes.

They can be obtained in energy ranges from thousandths of a watt to a hundred watts at firm prices, and growing experience will lead to development of more uses for which their special properties may be more advantageous than ordinary power generators. It is also probable that batteries with higher energies may be available.

These conclusions were reached by a study group of experts from six nations who have just concluded a meeting at the Inter-

This one operator controls all operations, from initial feed to final discharge of mixed materials into lorries, at a new fully automatic factory in Britain capable of producing asphalt at the rate of 100 tons an hour. The operator is able to follow the various processes on the illuminated mimic diagram in the dust-proof cabin. The specifications for 10 different mixes are recorded in a memory unit. Solid-state logic switching controls loading of ingredients into the mixer and discharge into the waiting vehicle at the conclusion of the mixing time.

NEW TANDBERG "SERIES 12"
RIES 12" NEW TANDBERG "SE
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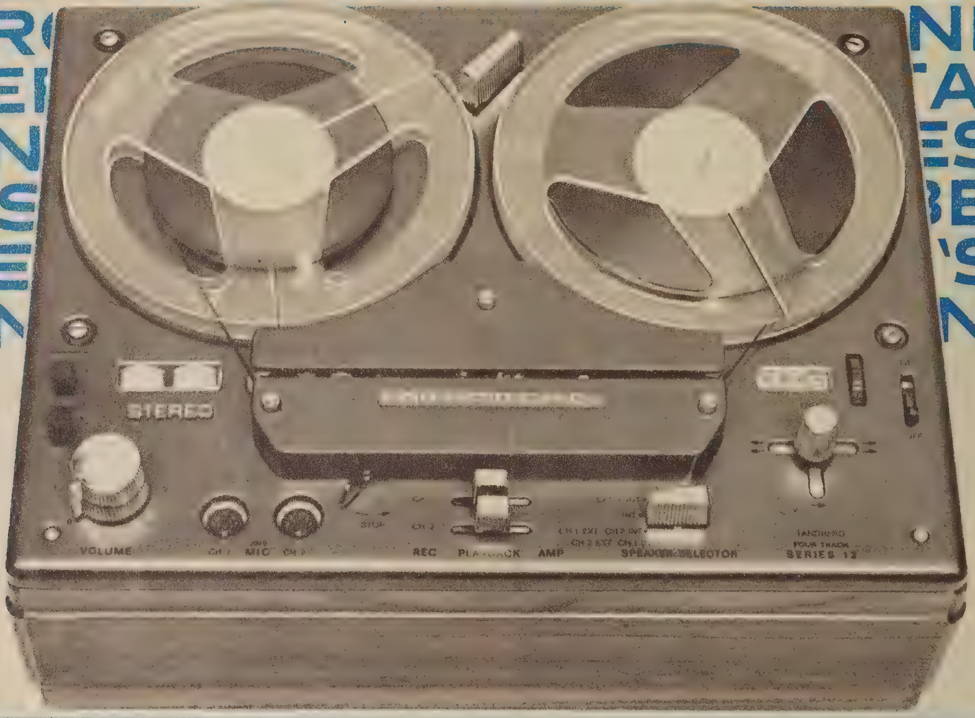

THE NEW TANDBERG "SERIES 12"
A COMPLETE HIGH FIDELITY STEREO SYSTE

NOW COMPLETELY SOLID STATE!

Although firmly established as the world's leading manufacturer of high-quality, precision tape recorders, TANDBERG's development policy requires continuing research in engineering and electronics. This fine new stereo recorder, the TANDBERG "Series 12", is the latest product released by the TANDBERG research laboratories.

Completely solid state, the "Series 12" incorporates **twin ten watt R.M.S. stereo amplifiers**, two built-in wide range loudspeakers, concentric volume controls for each channel, two electronic beam indicators for positive control of recording levels — and high or low level sensitivity ratio inputs automatically give priority to two low impedance dynamic microphones by means of double circuit jack sockets conveniently situated on the top panel. Separate bass and treble controls, one lever tape transport operation, momentary start/stop, automatic end-stop and an illuminated four digit revolution counter are additional features. Special inputs are provided for ceramic or crystal pick-ups for recording or for high fidelity stereophonic record reproduction. Connection of external speaker systems and switching for all speakers has been greatly simplified. External amplifiers may be used with the "Series 12" pre-amplifier outputs, and a centre channel output enables the individual mixing of program material from both channels.

The TANDBERG "Series 12" can be the heart of any high fidelity stereophonic musical reproduction system. Add a radio tuner, pick-up and external speakers
the "Series 12" is one of the finest ste
systems available! And for language st
the lesson may be recorded on one tr
the student's responses on another. B
tracks may be played simultaneously
individually — comparison of pronuncia
and intonation is greatly simplified.

Hear the TANDBERG "Series 12" at
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. . . in terms of sound quality this
recorder represents extraordinary value
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A.C.T.: Australian Physical Laboratories, P.O. Box 225, Canberra City.
Tel. 4 3010 (Mr. J. E. Howe)
N.T.: Pfitzner's Music House, Smith Street, Darwin. Tel. 3801

ional Atomic Energy Agency (IAEA) in Vienna. They were nsidering terrestrial applications against the background of ex- ience with space vehicles as well as with generators used for pping beacons and in Antarctic weather stations. Some have n operating, and are still working well, for more than 40,000 ırs continuously (about six years), thus proving their long life, iability and freedom from routine maintenance requirements.

As marine aids, say for navigation buoys or lighthouses, as h meteorological stations, it was felt that there could be clear vantages in remote situations from which continuous signals are eded but where maintenance of conventional batteries would be nost impossible.

The valve division of Standard Telephones and Cables Ltd. in U.K. has just manufactured its ten-thousandth travelling wave tube, now widely used as wideband amplifiers in microwave links. Manufacture of the tubes is a complex operation involving over 30 main processes and application of many techniques. The technician here is aligning the cathode with the other electrodes in the electron gun assembly of a travelling wave tube.

aws cut without touching

Saws which never touch the material they are cutting are used International Business Machines, Armonk, New York, to slice ittle semiconductor chips.

The saws are stainless steel discs turning at 12,700 revolutions minute. The cutting is done by an abrasive slurry slung off by ıtrifugal force from the discs. Cuts are .030in apart and the fs .004in. Forty discs separated by spacers .030in thick, make a gle saw cutting 40 lines at a time. Cutting time is about one nute per inch.

ackaged crystal oscillators

A new range of packaged transistorised oscillators offering sign engineers a low-priced medium-stability frequency source, used in a single plug-in unit, has been announced by the Marconi mpany Ltd., Chelmsford, Essex, U.K. The announcement by company says:—

"A 6-volt, low-current supply is all that is required to power an icient ready-to-use crystal oscillator with applications in many ınches of electronics. Mounted on international octal or B7G ve bases, they can be provided at frequencies in the range of Hz to 100MHz. The more compact B7G unit, type F3171, ich covers the range 115KHz to 100MHz, has the added feature t it can be placed in a standard Marconi F3006 crystal oven to ovide increased temperature stability.

"The larger octal based unit, type F3170, covering the range o 115KHz, is contained entirely in a single anodized aluminium tubular case, 1.125in in diameter. Depending on frequency, the seated height varies from 3.125in to 5in whereas the higher frequency oscillators, with a B7G base, have a standard seated height of 3.125in. These units are also contained in a cylindrical aluminium can, but of ⅞in diameter.

"Stabilities better than 1 part in 10,000 are obtainable with a temperature variation of 20 to 70 degrees C. which represents the operating temperature range. If desired, the frequency of the units can be trimmed by means of an external variable capacitor connected between one of the base pins and earth.

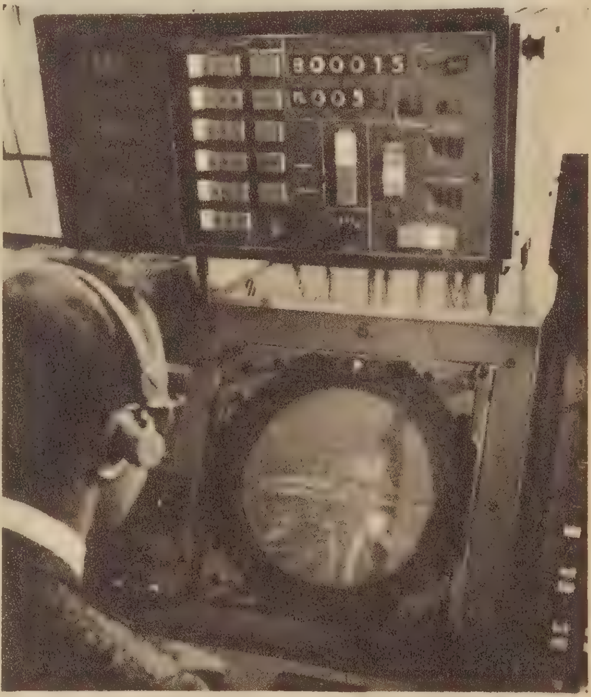
"Each oscillator, built around a glass encapsulated quartz crystal, has a buffer output stage which maintains a frequency stability of less than 1 part per million for a 10 per cent variation in the load impedance. The output impedance is 5000 ohms ±10 per cent with an output voltage of 2 volts, peak-to-peak."

Automated fare collector

The U.S. Illinois Central Railroad is the first railway in the world to introduce a comprehensive automatic fare-collection system. Computerised gates for fare collection at five city stations on the railroad's Chicago lines came into operation on July 1 this year. The system was designed and produced by Litton Industries' Advance Data Systems Division, of Beverly Hills, California.

The Litton system uses automatic gates, interlocked with automatic ticket readers, at entries and exits of the five stations. On multiple ride and commutation tickets, each ride is electronically subtracted at the exit gate. While the first "auto-gate" stations are in the Chicago city area, all stations on the Illinois Central commuter network will be equipped with the automatic fare collection system by February 1967.

Electronic equipment of the same type being placed in service by the Illinois Central has been tested experimentally on the London Underground subway system and on Long Island Railroad in New York. A similar system will be used in San Francisco when the Bay Area Rapid Transit District goes in service later this decade.



Eurocontrol, the seven-country organisation which has direct executive responsibility for the control of all civil aircraft flying in the upper airspace over Europe, has placed a contract jointly with the Marconi Company and Compagnie Francaise Thomson-Houston for the provision of secondary radar systems for airports at Shannon, Ireland and Brussels, Belgium. This is the first order for the new Anglo-French secondary radar equipment, SECAR, which has great operational flexibility and can cater for all interrogation modes. The picture shows a SECAR control and indicator unit above a normal radar display. The screen displays secondary radar responses, and a video map of the English and European coastlines. The SECAR indicator unit is showing the active decoding of signals received from an aircraft replying on Mode B and Code 0001.

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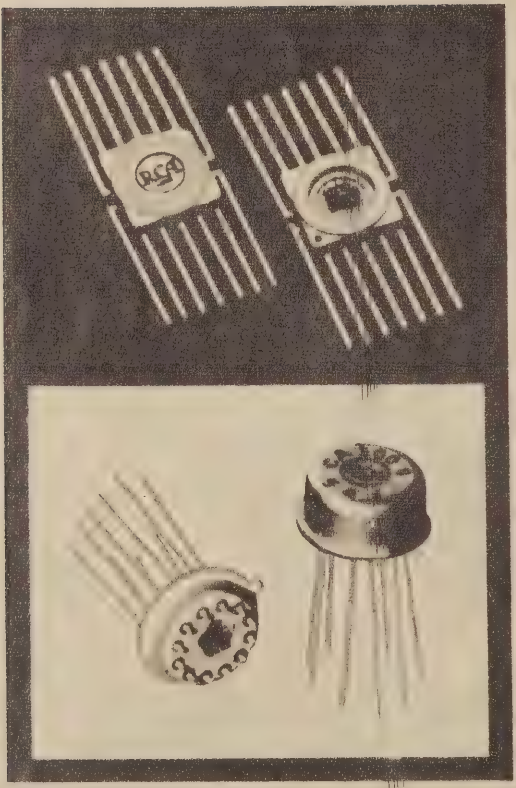

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Detects wear in power lines

Apparatus for detecting and recording ear in the overhead power lines used by lectric trains and trams has been developed y Clause Piat, 56 bis Avenue du Midi, aint-Maur (Seine), France.

It consists of a carriage for traversing long the wires equipped with wearetecting elements in the form of convex ollers. Any deviation from normal is transitted to the recording system. Examination an be carried out at a high speed.

Pulsed power for batteries

Primary batteries which give their power pulses, making them ideal for paceakers and similar purposes, have been eveloped under an American Government rant. Details are available in Report D-632 103 from the Clearinghouse, Springeld, Virginia.

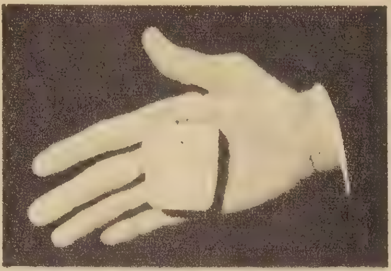
Batteries built so far have been able to ash torch bulbs with a frequency of 15 ashes per second. Output is about onealf watt from a cell the size of two rdinary torch batteries. The batteries evelop 0.8V at 400 milliamperes.

Electronic switch

Implanted devices in humans or experiiental animals can be switched on and ff from outside the body by means of a nit developed at the Institute of Psychiatry, laudsley Hospital, London. It consists of radio-frequency oscillator operating at 0MHz placed over the position of the nplant and switched on. This generates pulse in the switching circuits of the nplant which will turn on the associated device. Provided the oscillator is moved away slowly before being turned off, the implant will remain in the on condition. It can be turned off by replacing the oscillator and switching this off.

The device is expected to be of particular use where implants are not continuously needed. The ability to turn them off and on at will should greatly extend the life of the tiny batteries that drive them.

This lightweight electronic distance measuring equipment has an all-transistor circuit design, with all the electronic components mounted on a single printed wiring board. Known as the MRA 101, it is manufactured by the Tellurometer Company, of Ilford, Essex, U.K. It is designed especially for urban use and has a large (13in diameter) reflector to achieve a high degree of accuracy, while the beam width of only 6 degrees ensures that reflections from passing traffic are kept to a minimum.



This new pocket receiver is part of a personnel calling system developed in U.K. by Multitone Electric Company Ltd., Underwood St., London. N.1. It is just over 4in long and weighs 3¼oz. The associated transmitter operates at a frequency in the 13 to 50MHz band, using a free radiation aerial. An encoding equipment feeds a selected call signal to the transmitter, thereby causing the selected receiver to emit a "beep" to alert the wanted person, when the operator can transmit a voice message to the receiver.

De-salting water at low cost

Sea-water can be turned into fresh at a cost of 3 cents per thousand gallons, claims Albert H. Aul, president of General Marine Technology Co., of San Bernardino, California. The lowest previous cost has been 25 cents per thousand.

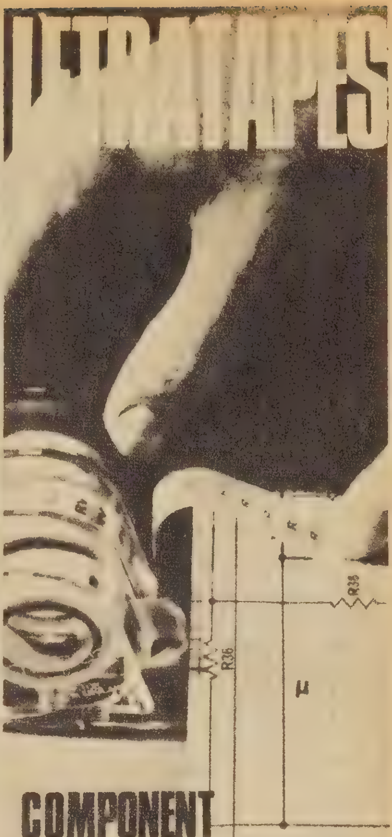
Aul says his method combines ion exchange and flocculation techniques. After the ion exchange, used now to soften hard water, a flocculant is added. This reacts with the water chemicals to produce soft white precipitate which sinks through the water, taking the salt with it. The fresh water can then be drawn off the top of the settling tank.

News flash indicator

An electronically controlled news flash system developed in Holland by Philips of Eindhoven is operated from punch tape. The characters are picked up by an electronic transmission system and transferred to a series of letter panels. There are 15 of these, each containing 168 lamps, and they can be placed at any required distance from the reading system. This has a stepped motor and a photocell system to read each symbol from the tape.

The letters corresponding to the feed are held in an electronic memory and fed line by line to the letter panels. As soon as one letter is completed, the motor moves the tape to the next position. About 400 characters can be punched on three feet of tape and this can be used in closed loop systems.

The small glow lamps have a very long life and the cost of the operation is small. Applications include warehouses, supermarkets, exhibitions and in industry and advertising generally. ■



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Logic and counting circuits — 5

SHIFT COUNTING, and BCD

Counting with bistable elements, continued: Shift counting — the shift register — the normal ring counter — the twisted ring counter — bistable counting and BCD codes — construction of a panel with four gated R-S or J-K flip-flops.

by Jamieson Rowe

In the last article in this series, we introduced bi-stable circuit elements and looked at the three main types of flip-flop elements—the R-S, gated R-S and J-K varieties. We then discussed one of the two main ways in which such bi-stable elements may be used for counting, the so-called "ripple-carry" counting system. Let us now pass on to a consideration of the second system of counting using bi-stable elements: **"shift"** counting.

The principle of shift counting is that a series of bi-stable elements are interconnected in such a fashion that, when pulsed **simultaneously** by the input signal, they each behave in a fashion determined not by their own previous state, but by that of the preceding element. This may be used to shift a pattern of logical values along the register, so that the location of the pattern at any time may be used as a registration of the number of input pulses received.

Figure 1 illustrates the general principle involved, showing a section of a chain of elements connected in this fashion. J-K elements are shown, although gated R-S elements are in many cases equally suitable. Note that the input pulses (here often called "clock" pulses as they synchronise the transitions of all elements) are applied to all T terminals together.

DIRECT RESET CIRCUITRY OMITTED FOR CLARITY

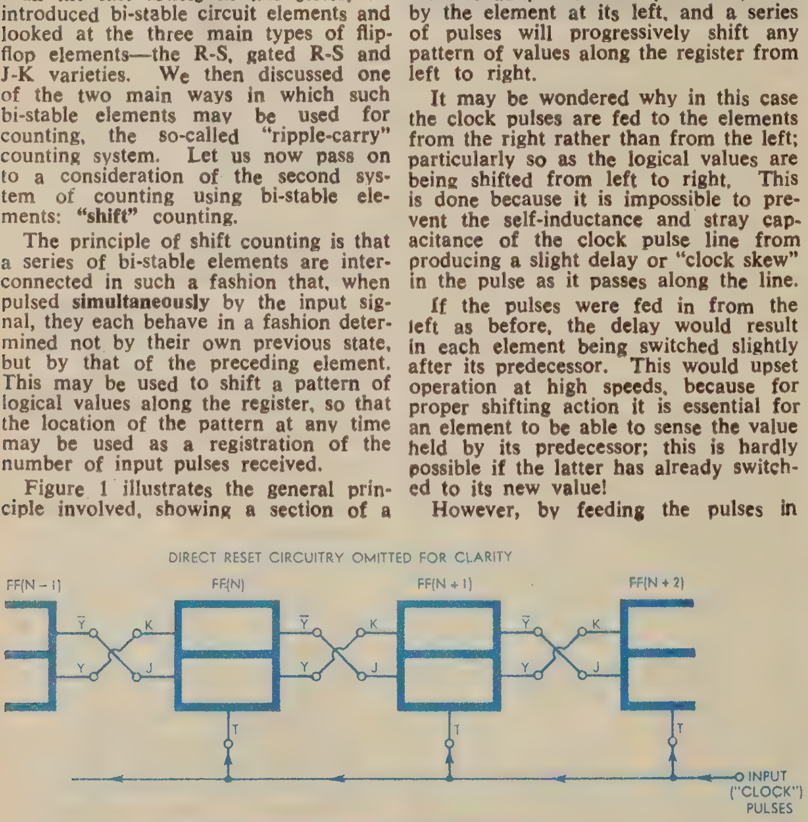


Fig. 1 SHIFT REGISTER (USING J-K ELEMENTS)

The cross-connection of inputs and outputs shown (Y to K and Y-complement to J) determines that when activiated by the clock pulses, each element switches to the state previously occupied by the preceding element. Thus if element FF(N−1) is set to Y=1, the first clock pulse will force FF(N) to be similarly set, the second pulse will force FF(N + 1) to be set, and so on. Thus each clock pulse will cause each element to adopt the value previously held by the element at its left, and a series of pulses will progressively shift any pattern of values along the register from left to right.

It may be wondered why in this case the clock pulses are fed to the elements from the right rather than from the left; particularly so as the logical values are being shifted from left to right. This is done because it is impossible to prevent the self-inductance and stray capacitance of the clock pulse line from producing a slight delay or "clock skew" in the pulse as it passes along the line.

If the pulses were fed in from the left as before, the delay would result in each element being switched slightly after its predecessor. This would upset operation at high speeds, because for proper shifting action it is essential for an element to be able to sense the value held by its predecessor; this is hardly possible if the latter has already switched to its new value!

However, by feeding the pulses in from the right, clock skew simply causes each element to switch slightly **before** its predecessor—an effect which in no way upsets operation.

The cross-connections shown in figure 1, it may be noted, are electrical rather than logical: logically, the elements must be connected directly if each element is to adopt the value held by its predecessor. However, it may be remembered that with flip-flops of the type shown last month in figures 4 and 5, the logic polarity at the inputs is opposite to that of the outputs—hence for direct **logical** connections the **electrical** connections must be crossed as shown.

Any system of bi-stable elements connected in the manner shown in figure 1 forms what is commonly termed a "shift register." Quite apart from their uses in counting, such registers are widely used for storage, arithmetic and conversion operations on binary numbers.

It should be fairly evident that would be a relatively straightforwar matter to "shift" a long binary numbe into such a register, store it conver iently therein either while operatin upon it or otherwise, and then "shift it out the other end when desired. Th number of elements in the register quit naturally determine the number of bi in the largest binary number that coul be handled in this fashion.

As with the ripple-carry configuratio the shift register can be made to operat in the reverse direction: in this case b deriving the input gating signals from th "succeeding" elements rather than th "preceding" ones. And similarly a b directional shift register can be produce by employing two sets of gates to cor trol which of the two sets of gating si nals control the elements at any desire time. Such variants of the shift registe are not illustrated as they are somewh outside the scope of the present articles.

For counting purposes there are tw main variants of the shift register whic are worthy of our attention. These a the so-called "normal" ring counter an the "twisted" or "switch-tail" ring coun ter.

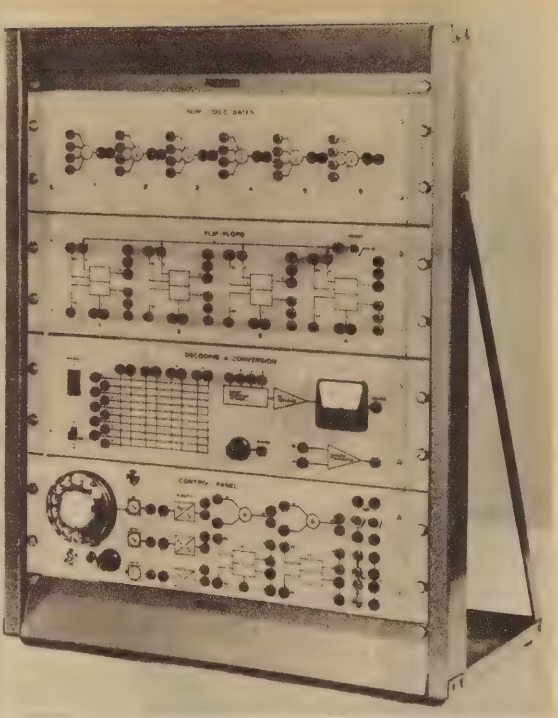
The **normal ring counter** (often simpl called the "ring counter") consists of shift register in which the two ends hav been joined to form a closed loop. pattern of logical values is circulate around the ring or loop by the inpu pulses, so that at any time it is possib to note the number of pulses which hav been received by observing the positio of the logical value pattern. Figure shows a small ring counter employin five flip-flops; those shown are of t gated R-S variety, although the J-K ty are equally suitable.

It is usual with normal ring counte to circulate a pattern consisting of single logical "1" together with zer for all the remaining values; this mak it fairly easy to determine at any tin the "position" of the pattern around t ring.

Thus in a typical application of t counter shown in figure 2 the reset-s circuitry would be arranged so th prior to the arrival of input pulses FF was set (Y=1) and all four other fli flops reset. On the arrival of the puls the "1" would then be shifted in tu to FF2, FF3, FF4 and so on. The fif pulse would return it to 1 to begin new cycle.

This can be conveniently shown the following table. Here, as before, t values in each flip-flop column repr

Described in this article is the second panel of the digital demonstrator-breadboard unit, shown here complete. The third and fourth panels are described in later articles.



t the value of the Y output after each ut pulse:

INPUT PULSE	FF1	FF2	FF3	FF4	FF5
0	1	0	0	0	0
1	0	1	0	0	0
2	0	0	1	0	0
3	0	0	0	1	0
4	0	0	0	0	1
5	1	0	0	0	0
6	0	1	0	0	0

In passing it is perhaps worth pointg out that the normal ring counter ust have a preset pattern of values in der to perform counting. If all ements are either set to Y=1 or reset, Y=0, counting cannot occur simply cause there is no pattern to "pass ound the ring."

It should be fairly obvious that the rmal ring counter will count only in ultiples of the numbers of elements the ring. To count to decimal "N," flip-flops or other bi-stable elements ust be used — unless special arrangeents are made, such as cascading ring unters or combining complementing ges and ring counters.

As with ripple-carry counters the noral ring counter may also be used for aling and frequency division. Thus a ng of five elements becomes a ×5 aler or frequency divider, etc. As th counting it is possible to extend e range by cascading ring counters or mbining them with complementing ges.

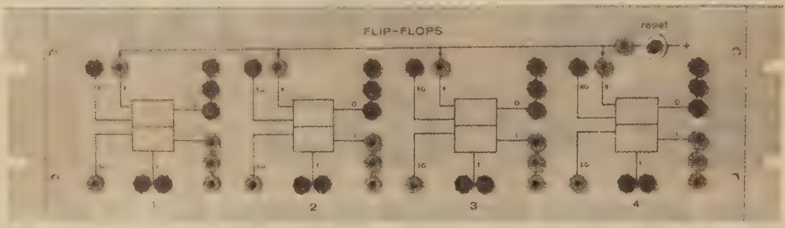
In a normal ring counter circulating single "1" there are only two elements ich change state following any input lse: the element which switches from to 0, and its successor which switches om 0 to 1. Thus only two elements ve to "settle down" following an input pulse before the counter is ready for a following pulse. Because of this the normal ring counter is quite suitable for counting at high speeds.

Even so, however, it is not as suitable as the other counting variant of the shift register: the **"twisted" or "switch-tail" ring counter.** This type involves only **one** element transition per input pulse, and in addition is able to use the same number of elements to count twice the number of pulses.

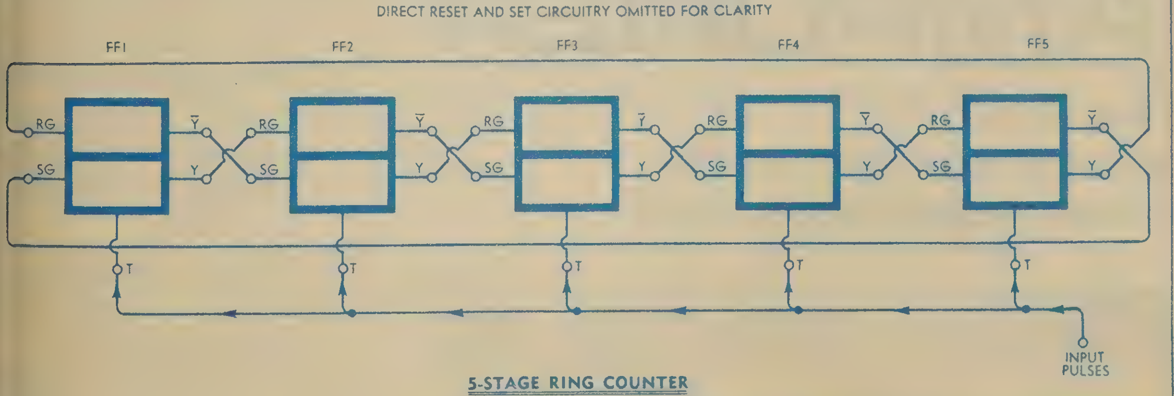
Figure 3 shows the logic diagram for a twisted ring counter involving five elements; here again either gated R-S or J-K types may be used. It may be noted that the only difference between this type and the normal ring counter is that the end-to-end connections are made directly electrically — giving a **logical** twist or inversion.

The twisted ring counter does not have to be supplied with a preset pattern as did the normal ring counter: it generates its own pattern, as a result of the logical inversion produced by the twisted end-to-end connections. Prior to the arrival of input pulses the elements are simply reset to Y=O as with ripple-carry counting elements.

On the arrival of the first pulse, FF1 sets to Y=1 — because owing to the logically twisted connection it must take a value **opposite** to that of FF5. Similarly when the second pulse arrives FF1 remains set, because it is still forced to do so by FF5; however, in addition FF2

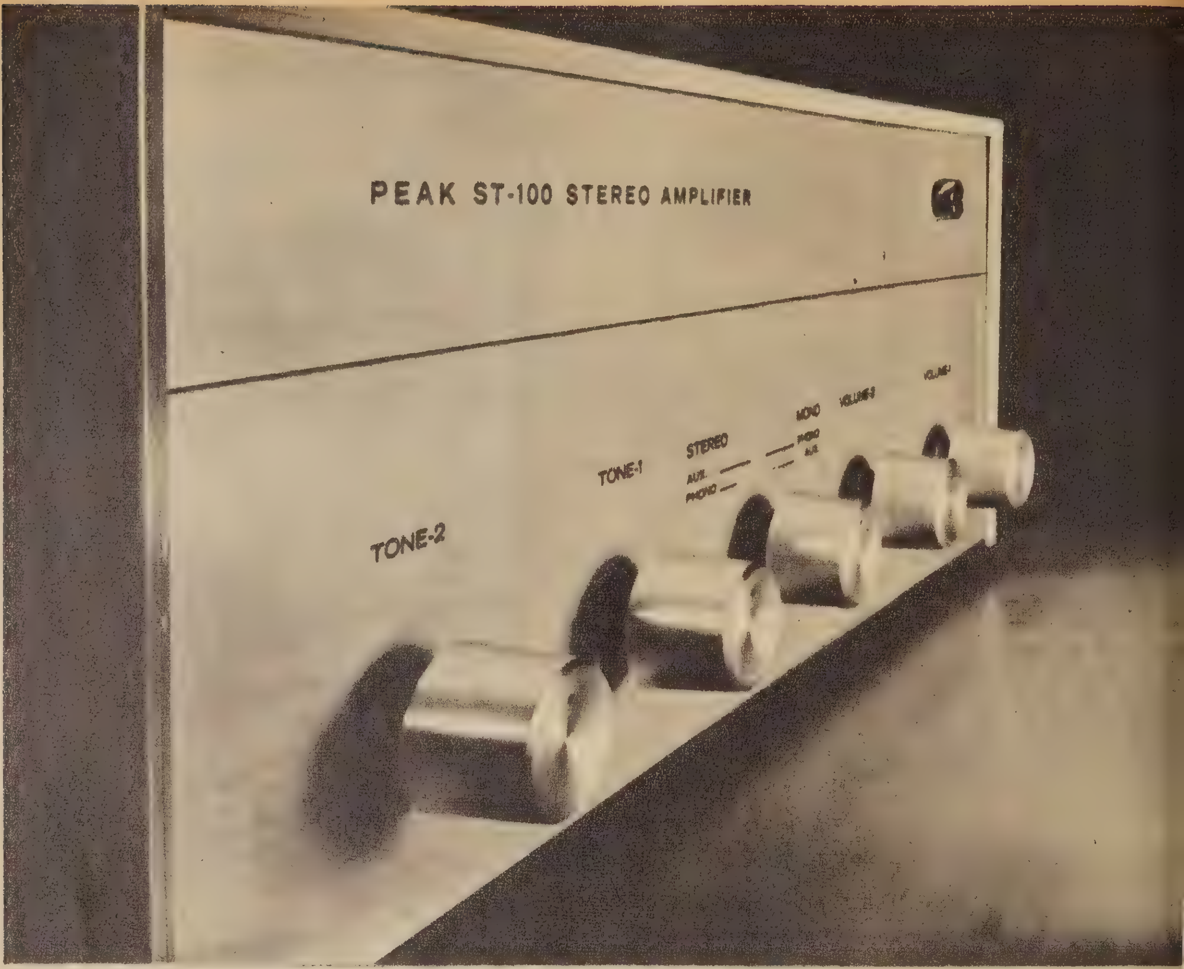


A close-up of the flip-flop panel described later in this article. The four flip-flops may be either the gated R-S or J-K variety, as desired.



5-STAGE RING COUNTER

Fig. 2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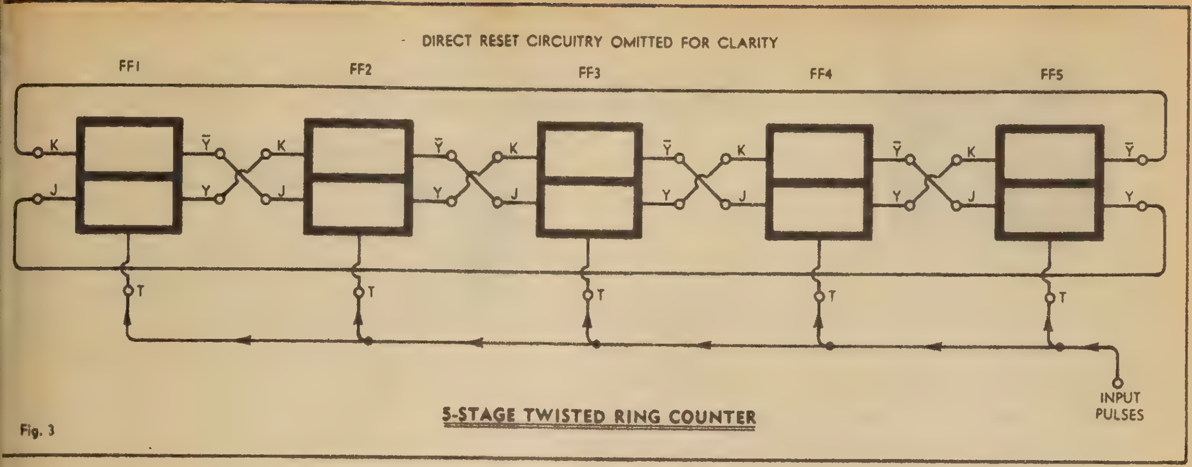


5-STAGE TWISTED RING COUNTER

Fig. 3

set by the second pulse, as FF1 con- ols its switching.

On the arrival of the third pulse, FF1 emains set; so does FF2. However, F3 now sets also under the control f FF2. Similarly on the fourth pulse F1, FF2 and FF3 remain set while F4 sets; and on the fifth pulse FF5 ts while FF1, FF2, FF3 and FF4 re- ain set.

On the arrival of the sixth pulse, unting continues but in a different ay: now FF1 is forced to reset be- use this time FF5 is set. And on the venth pulse FF2 also resets under the fluence of FF1, which remains reset ecause FF5 in turn remains set. Thus r the second phase of operation the ements of the register progressively d cumulatively reset, until on the nth pulse all five are reset and ready r a new cycle of operation.

This operation is conveniently shown y the following table, where again the alues shown in the columns represent e values at the flip-flop Y outputs:

INPUT PULSE	FF1	FF2	FF3	FF4	FF5
0	0	0	0	0	0
1	1	0	0	0	0
2	1	1	0	0	0
3	1	1	1	0	0
4	1	1	1	1	0
5	1	1	1	1	1
6	0	1	1	1	1
7	0	0	1	1	1
8	0	0	0	1	1
9	0	0	0	0	1
10	0	0	0	0	0
11	1	0	0	0	0
12	1	1	0	0	0

It may be seen from the table that t only does the twisted ring counter volve only one element transition per put pulse, making it ideal for high- eed counting, but it also provides an fective count of twice that provided the normal ring counter. Expressed nerally, a twisted ring counter of "N" ements provides unique value-patterns r a maximum of 2N input pulses.

Readout of the count of both normal d twisted ring counters is performed much the same way as with the pple-carry counter. Low-loading indi- tion circuitry is connected either rectly or via decoding circuitry to e outputs of the bi-stable elements in der to sense their state. As mentioned rlier, readout and decoding techniques ll be discussed in later articles.

Thus far in this discussion of bi-stable unting circuitry, we have considered at might be termed "straight" counting, where the bi-stable elements count in a straightforward manner determined by the counting method adopted and the number of elements involved. Thus a register of "N" elements will count up to one less that the Nth exponent of 2 in pure binary if it is arranged for ripple-carry counting, or up to decimal N or 2N in more-or-less decimal fashion if it is arranged for normal or twisted ring counting respectively.

However, as mentioned in the third article in this series, it is often desired that counting and other operations be performed in a way which allows read-out in a numerical code — usually a BCD code.

In general, shift counters do not lend themselves to BCD counting; however, this is rarely an embarrassment as in most cases they can be used either for direct decimal counting or for counting in a convenient special code. Perceptive readers will have already realised that a five-element twisted ring counter is ideal for decimal counting; similarly a ten-element normal ring counter can be used for the same purpose, although the latter would be rather uneconomical because of the number of elements employed.

Usually a more convenient way of using the normal ring counter is to combine a five-element register with a single × 2 complementing element. Depending upon whether the single element is placed "before" or "after" the ring counter, this arrangement counts decimalwise in either "qui-binary" or "bi-quinary" code respectively. It is also possible to count in the latter codes using less than six elements — by combining complementing elements with small twisted-ring counters or gated-carry registers. However such techniques are outside the scope of this article.

As one might expect, it is ripple-carry counters which are mainly associated with counting in BCD codes — because of the basically binary nature of ripple-carry counting

There are many ways in which a ripple-carry counting register can be arranged to count in a BCD code. However, the simplest method is that in which pulse feedback is used to modify

The circuit of the flip-flops used on the demonstrator panel, showing variations between the gated R-S and J-K versions. The NOR gates on the first panel may be used with the flip-flops for simple binary readout.

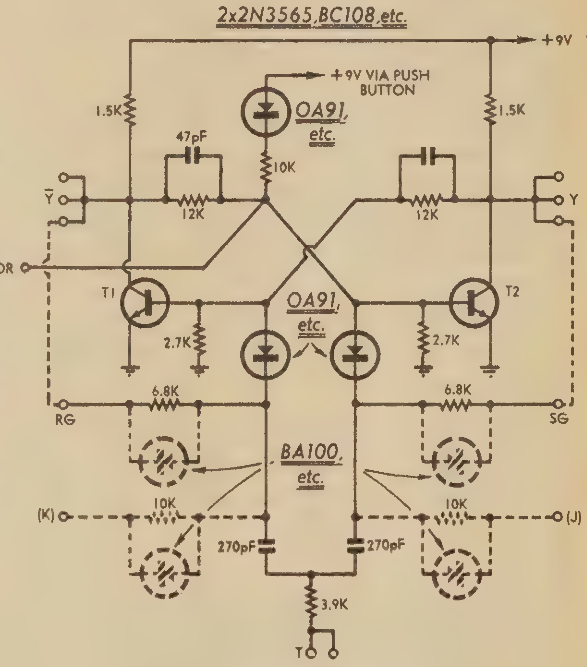


Fig. 5

PANEL FLIP-FLOP
(MAY BE MADE EITHER GATED R-S OR J-K ELEMENTS)

Special Effect Unit

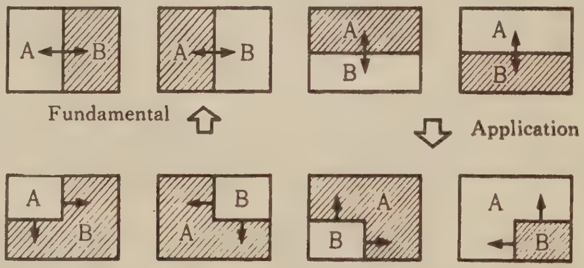
View of SE-101-1A Special Effect Unit

The SE-101-1A is a low cost solid state special effect unit specially designed for any TV system and produces wipes and other special effects. By selecting any two signals from four video inputs, one from the yellow and the other from the blue pushbuttons, any desired portion of picture (A) is wiped out and an optional portion of picture (B) is inserted into the wiped portion.

Superimposing of two pictures, for example, close-up and distant scenes, racing and its record of time score, live and still programs, etc. is also displayed simultaneously with this unit.

It must be noted that the video inputs should be supplied from the units driven by the single sync generator.

Two models of the unit are available: one is for standard 19" panel mounting and the other a box type



Inputs

Video Signal only: 1.0 Vp-p, positive
Number of Inputs: Four
Impedance: Bridge connection
Connector: SO-239

External Control Signal

Horizontal Driving Signal: (H. D) 4 Vp-p, negat
Vertical Driving Signal: (V. D) 4 Vp-p, negat
Blanking Signal: (BLK) 4 Vp-p, negat

Sync Signal: (SYNC) 4 Vp-p, negat
High impedance, bri
connection, 5-cont
connector

Outputs

Video Signal (V): 1.0 Vp-p, 75-ohm,

Model VMF-104

Type VMF-104 is designed so as to make fade and-out operations of two video signals selec from four video signals. The mixing is perform by two levers located on a front panel and mix ratio can be changed continuously.

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BRANCH OFFICES: MELBOURNE — BRISBANE — ADELAIDE — PERTH rry-over at various stages of the unt.

This is illustrated in figure 4. Here register of four gated R-S or J-K ments is shown modified to count in 21 BCD code by means of two small dback capacitors connected from the complement output of FF4 to the rect reset inputs of FF2 and FF3.

After the elements are "cleared" or set via a logical 1 (=+9V) applied the direct reset line, the operation of is circuit is identical with that of last onth's figure 6 up to and including e arrival of the seventh pulse. After e arrival of this pulse, FF1, FF2 and F3 are all left in the set or Y=1 ate, as with the earlier circuit.

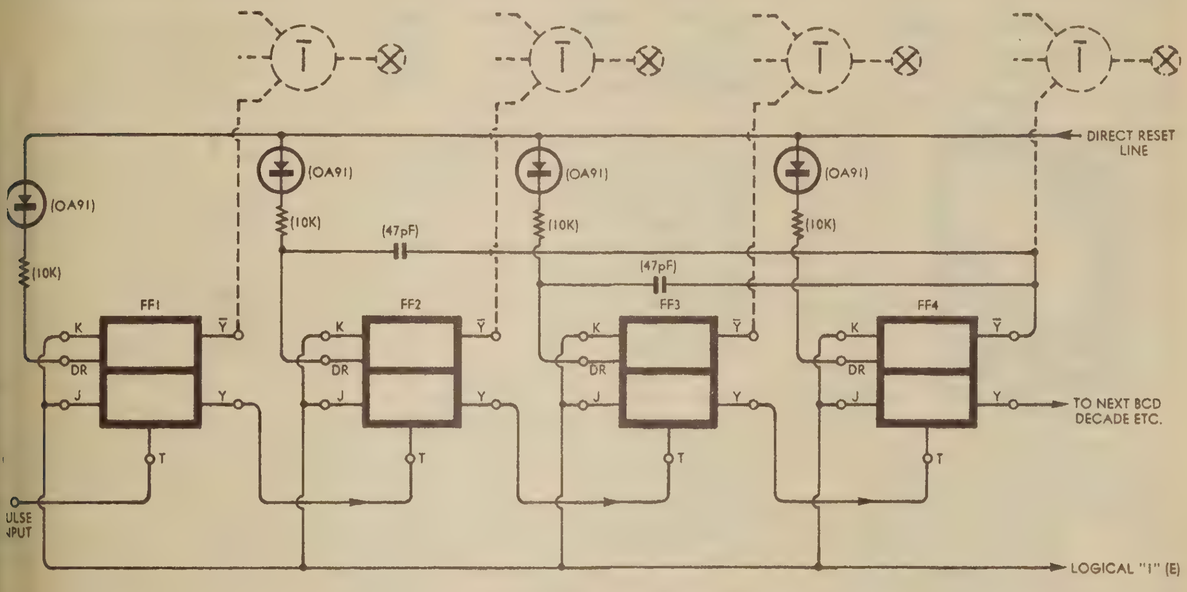


Fig. 4

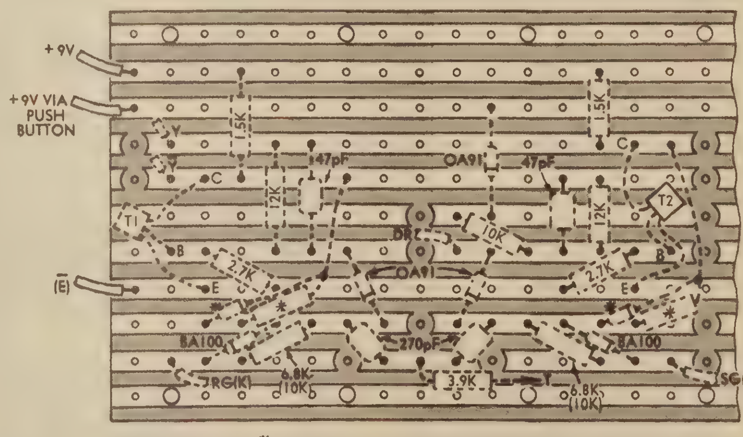
J-K RIPPLE-CARRY REGISTER WITH FEEDBACK FOR BCD COUNTING — ONE DECADE

On the arrival of the eighth pulse, owever, the effect of the capacitors ecomes apparent. As before, the pulse sets FF1—which in turn resets FF2, hich in turn resets FF3, which turn feeds a pulse to FF4. nd as before, FF4 switches over the set state. However, as is produces a negative-going transition at the Y-complement output of F4 a pulse is fed via the feedback apacitors to FF2 and FF3 — **with the sult that both these elements are romptly set to Y=1 again.**

Note that the direct reset or DR inuts may be used for pulse setting of e elements, by arranging for the ulses to be negative-going. The pulses us have the opposite effect to the DC gnal applied to the direct reset line sed to clear the register, in this case tting the elements concerned rather an resetting them.

After the eighth pulse, therefore, the gister shows not the pure binary veron of decimal 8 or "1000" (reading e Y outputs from right to left), but 1110" — which is the representation decimal 8 in 2421 BCD code. And ith the ninth pulse FF1 is also set, to ve "1111" or decimal 9 in the same de. On the tenth pulse all four ements reset to begin a new count.

In a similar fashion, feedback may e used to arrange a four element regisr to count in many of the BCD codes hich were discussed in the third article.



* REQUIRED IF MADE AS J-K ELEMENT

PANEL FLIP-FLOP — WIRING DIAGRAM

Fig. 6

However, if it is simply desired that the register count in decimals without any particular preference for the code adopted, any one of these many feedback configurations may be employed—although often the configuration shown in figure 4 will prove to be one of the simplest and hence one of the most attractive economically.

It is worthwhile to realise that as four bi-stable elements are potentially capable of producing 16 different value combinations, adapting them to reset after only 10 of these combinations — regardless of the coding or method employed—amounts to adding a "filler" of 6 to the number being counted.

Just where the filler is added to the count will of course depend upon the code employed; in the circuit of figure 4, it is added at the eighth pulse. This can be seen by noting that in 2421 BCD decimals 8 and 9 are equivalent to decimals 14 and 15 in pure binary. Other BCD codes insert the filler in different places—sometimes by "instalments" rather than all at once.

Other methods of arranging ripple-carry counters to count in BCD codes include gating methods, wherein AND or OR gates operated by the outputs of the elements modify the inter-element coupling at various stages of the count. Such methods are often used with J-K elements, as the "inbuilt" input gating circuitry of these elements can often be arranged to perform the required gating operations.

To conclude the present article, we give the following details of the flip-flop panel shown in the photographs, for the benefit of those readers who wish to construct one for themselves. Such a panel may be used individually for experimental or tuitional purposes, or one or more panels may be combined with the NOR gate panel described in the second article, and with panels to be described in later articles, to form a comprehensive digital demonstrator/breadboard unit.

The basic flip-flop panel features four simple flop-flops which may be made as either gated R-S elements or J-K ele-

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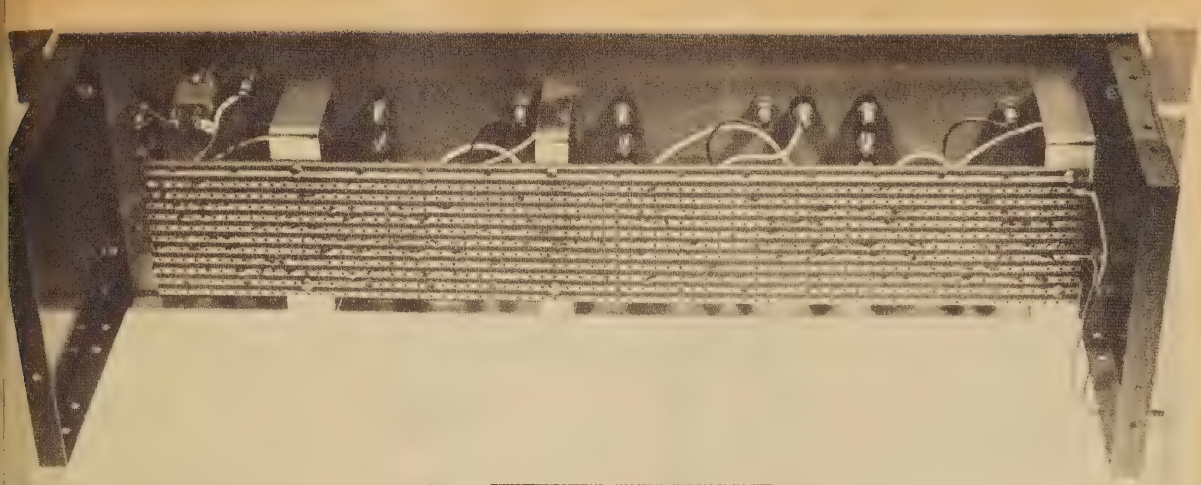
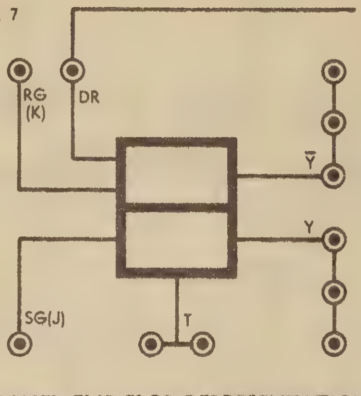


Fig. 7



PANEL FLIP-FLOP REPRESENTATION

ents as desired. (The simple R-S flip-p may be demonstrated using two of e NOR gates on the panel previously scribed.) The circuit for each of the p-flops is shown in figure 5.

As may be seen, the circuit is basi- lly that of figures 4 or 5 discussed in ticle 4. If gated R-S elements are sired, the circuit is wired virtually to ure 4 of last month; if J-K elements e desired the 6.8K gating resistors e taken to the outputs and additional ting components taken to the front nel terminals—which are then named " and "K" rather than "SG" and G".

The flip-flops are wired on a length "Vero-board," as with the NOR tes previously described. The strip of ard measures 14½in x 2½in, having ne useful conductors with holes on 2in centres; it is cut from a stock ero-board panel coded 4/1001 (one of ese stock panels will provide both e NOR gate and flip-flop strips). The nductors are cut and the components red as shown in figure 6.

The wiring panel is mounted to the ont panel in the same manner as with e NOR gate strip—using small uminium "U" brackets attached to the ar of the front panel by some of the nnection jacks. The latter are of the all "test point" banana-jack variety. The front panel is from the "Lektro- " range as before (code number LK- 1). Each flip-flop is represented on e front panel by a symbol and set of cks as shown in the photographs and e diagram of figure 7. The gating minals are marked either "SG-RG" or -K" depending upon the version be- g used. Note that the "T" input and tput terminals are given multiple jacks facilitate interconnections between ments.

The flip-flop panel may be operated m the same simple power supply de- ibed with the NOR gate panel. Thus, two panels may be used to demon- ate most of the techniques described this article, with four of the NOR es used as readout indicators for the p-flops (connect an input of the NOR tes to the Y-complement outputs).

Note that when using this set-up to monstrate a normal ring counter it l be necessary to first set all flip- ps and then reset all but one of m to provide the "1" to be circula- l. This MUST NOT be done simply connecting the DR terminal of the o-flop concerned directly to +9V— this is done, the transistors will be maged, due to the absence of protective resistance. Perform the resetting rather by using a 10K series resistor to momentarily connect each DR terminal to the +9V supply line.

As may be seen from the photographs, the two prototype panels thus far described in these articles have been mounted in a small Lektrokit rack (code LKR-5011). The rack provides a convient and attractive mounting system for the panels and provides space for the two further panels which are described in further articles.

It should, perhaps, be repeated that both Vero-board and Lektrokit components are obtainable from parts suppliers on order from the importers, E.M.I. (Australia) Ltd. In N.S.W., orders may be placed with the State distributor,

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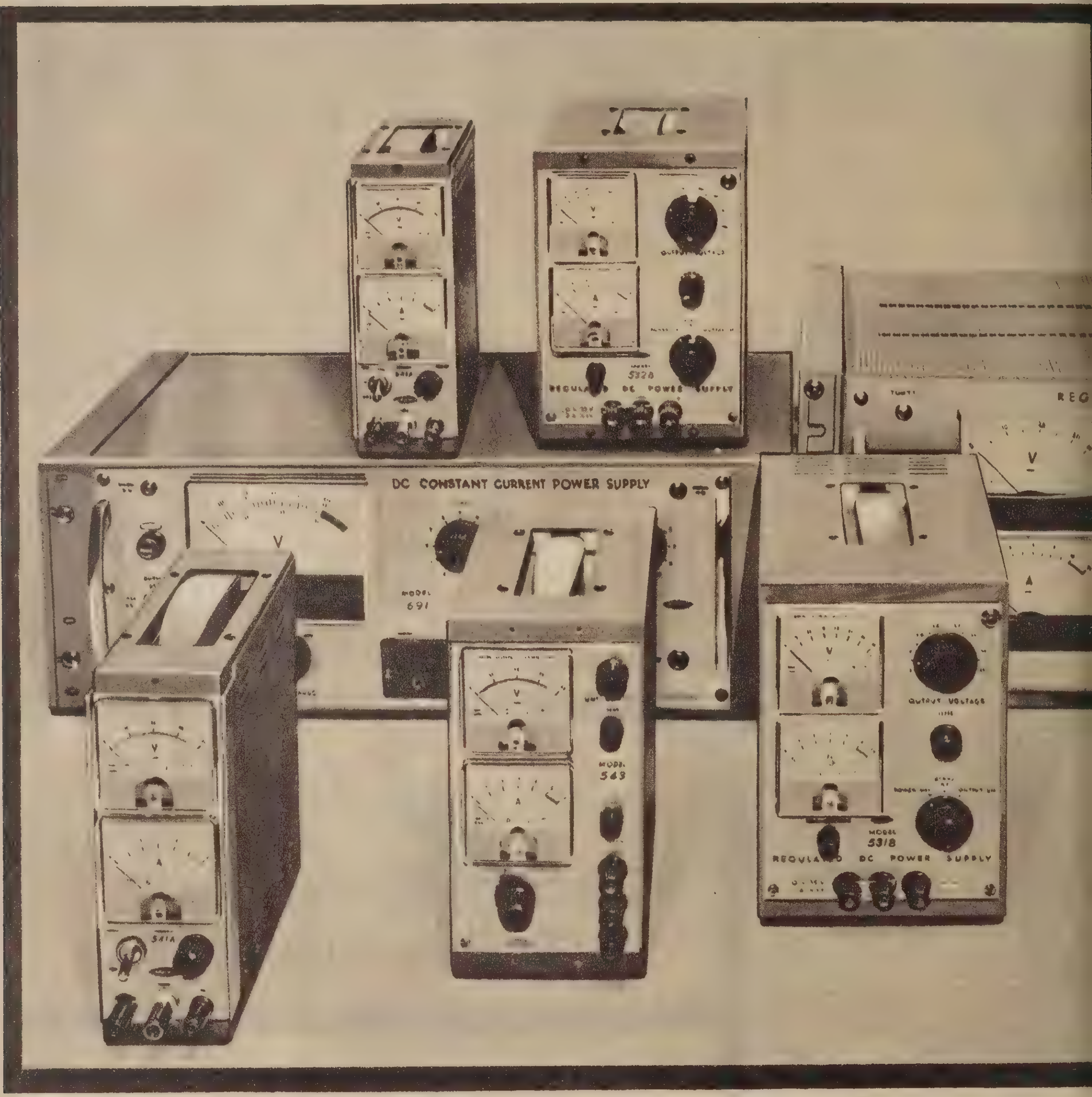
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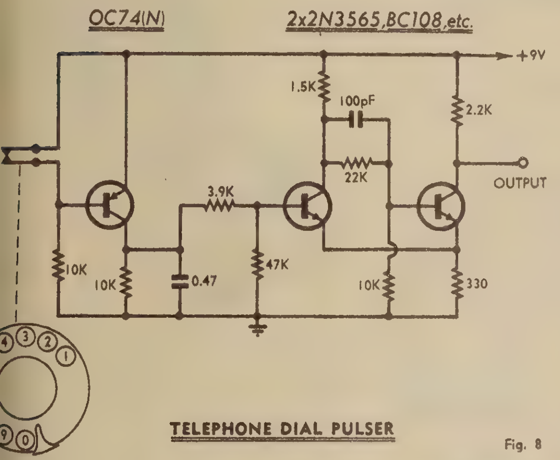
order that readers may be able eed pulses into the flip-flops at this e, we publish the circuit of a decimal e generator using a disposals telene dial (figure 8). As this circuit be discussed in a later article in nection with the description of one he later panels, it will not be dised in detail here. However, the folng brief explanation may be useful. ne pulsing contacts on a telephone are normally closed, opening for duration of the pulses. These are to hold the OC74 transistor off nally so that when they open during ulse the transistor bottoms (satur- and the supply voltage appears ss the 10K collector load.

ne purpose of the 0.47uF capacitor o partially integrate the resultant es. Partial integration is necessary ne dial contacts—like most mechanicontacts—are prone to generate t spurious pulses due to bounce. partial integration the spurious s are "lumped" in with the main and rendered incapable of upng or confusing counter operation.

the partially integrated pulses are somewhat rounded, it is necessary to "square them up" before they are suitable for feeding to the flip-flops. This is done by the circuitry asociated with the two BC108 transistors, which may be recognised as a transistorised Schmitt trigger circuit.

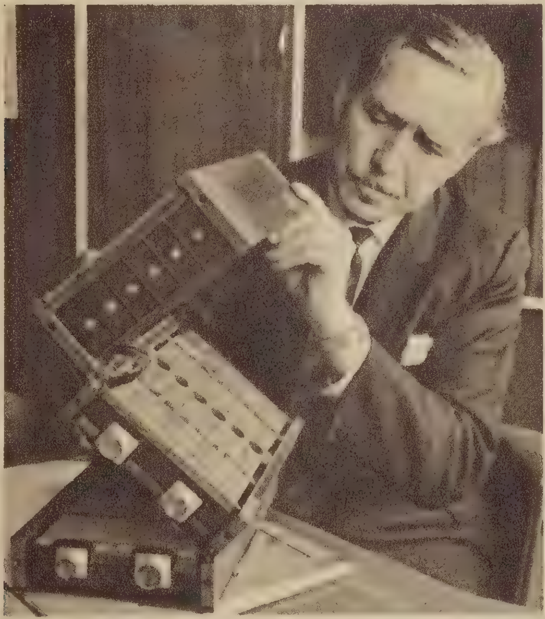
Further details of pulse generators and waveform converters such as the Schmitt trigger will be given in a later article in this series. For the present, the foregoing must suffice to allow readers to construct a small "outboard" dial pulser similar to that shown in the photographs.

(To be continued)



The circuit for a simple pulse generator using a disposals telephone dial. A similar circuit forms part of the fourth demonstrator panel.

Fig. 8



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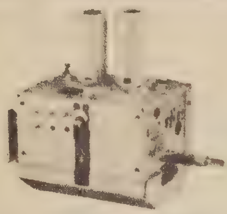

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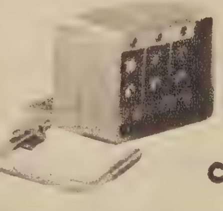

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NICKEL-CADMIUM CELLS FOR THE 1966 VTVM

n common with all multimeters, the 1966 VTVM requires ry cells or some similar sort of supply for the "Ohms" ranges f the unit. In the original design, we specified two No. 950 ype cells. These are very satisfactory, but advances in the ield of nickel cadmium cells makes these worthy of consid- ration for this application. Sufficient information follows to enable readers to use these cells in the 1966 VTVM.

By Ian Pogson

ce it was described in February, 966 VTVM has gained consider- popularity. It would appear that ly hundreds have been built and o doubt giving complete satisfac- o their owners.

A short time after the 1966 VTVM red in print, we were approached Jnion Carbide Australia Limited, eters of Eveready batteries, with dea that we perhaps could use cadmium cells for the "Ohms" t.

ore describing any such installation nt, we decided to fit a pair of these to our prototype instrument and over a period of time, so that we form our own conclusions as to nerit of the idea.

the benefit of readers who are amiliar with the characteristics of cadmium cells, a brief description em might be in order.

mpared with the ordinary dry cell, cadmium cells may be re-charged times, in the true sense of the They have an almost constant tial during the discharge period as as having very good charge reten- characteristics. They will stand up ore abuse than other types of cell compare favourably with other in terms of economy.

ckel cadmium cells have been with r a very long time, more than 50 in fact. In its earlier form, how- this type of cell was unsealed and as not suitable for portable use. re recent development has result- a cell which is hermetically sealed free from maintenance problems, as the need to add water. The cadmium cell is therefore now ble in fully portable form.

o important is the fact that nickel ium cells may be left for long ls in either a discharged or charg- ndition, without any ill effects.

voltage of these cells is lower the dry cell, which is generally lered as being 1.5 volts. The nickel um cell in its fully charged state each a level of about 1.47 volts. drops rapidly to 1.22 volts on dis- and it remains substantially at oltage throughout most of the dis- cycle. When the voltage finally to 1.1, the cell should be recharg-

much for the general characteris- o be more specific, we have fitted type N36T cells to the 1966 M. These cells are shaped some- like a large overcoat button, with lugs at the centre of opposite They are 1.697in diameter and n thick, plus solder lugs.

capacity is 450 milliampere hours, 10-hour rate. This size of cell is also capable of delivering 300 milliamps, at the one-hour rate, which makes them ideal for our purpose.

When initially purchased, these cells may be in any condition of charge. If the open-circuit voltage is 1.1 volts or less, a cell definitely needs recharging. If, on the other hand, the open-circuit voltage is in excess of 1.4 volts, the cell may be considered to be fully charged.

In between these values it is difficult to determine the actual state of charge. The best thing to do in these circumstances, is to discharge the cell at the 10-hour rate, in this case, 45 milliamps. The cell is considered to be discharged when the voltage has reduced to 1.1 volts.

It is then necessary to recharge the cell for 14 hours, at the 10-hour rate. For this size of cell this is 45 milliamps. It is a good idea to fully discharge the cell again and check if it has delivered its full capacity of 450 milliampere hours. If not, it should be "cycled" again. It may be necessary to put the cell through as many as three cycles to restore it to its full capacity.

Having reached its full operating capacity, the cell may be put into service. A desirable state of affairs is to float charge the cells, by installing a charging system into the equipment. In cases where the equipment is never switched off and the cells are not subject to heavy discharge, a maximum float charge current of nine milliamps should be set.

The circuit diagram, which should be read in conjunction with the full circuit published for the 1966 VTVM, shows how two N36T cells may be installed and float charged as suggested.

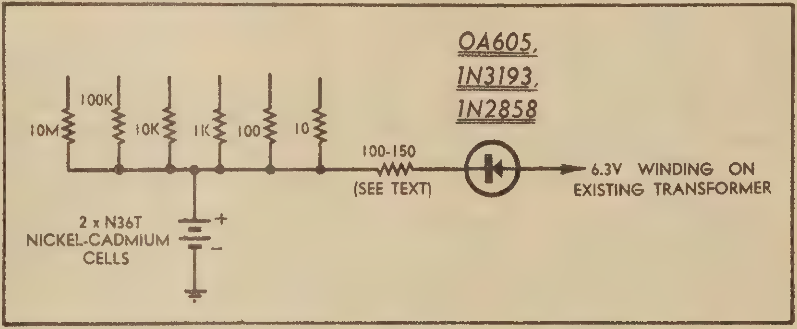
If the instrument is to be left on for 24 hours per day, then the 9mA charging figure should be strictly adhered to. However, it is hardly likely that this will be the case. In our particular case we use our instrument at irregular intervals and so we have increased this rate to a figure of 14mA. More than likely this figure will suit most users.

All that is necessary to set the charge rate is to fit the correct value of series resistor in the charging circuit. In the case of 9mA and using the 6.3 volt heater supply, the resistor value will be about 150 ohms. For 14mA, 100 ohms should be about right. In any case, it would be wise to check the actual rate with a multimeter and make adjustments where necessary.

The mechanical requirements for installation of the cells calls for some kind of clamping arrangement. The photograph shows quite well how we solved the problem. A positive and negative lug of each cell respectively are soldered together and the pair are then clamped together. We used a couple of pieces of scrap bakelite sheet, with long screws brought through holes toward each end.

The assembly is fixed by means of the screws to the back of the box. A three-tag strip provides terminations for the resistor, silicon diode rectifier and leads.

Once installed, the cells can virtually be forgotten. It will be necessary to adjust the OHMS zero potentiometer to allow for the lower voltage, but there is adjustment available for this. ■



The only additional components required for the charging circuit, are one resistor and a silicon diode. Just sufficient of the original circuit is shown, so that it may be correlated with the additional items.

This close-up picture of the inside of the box, shows how the nickel cadmium cells are fitted in place of the original dry cells. The silicon diode and resistor can also be seen.

A Look At Transistor Oscillator

Last month, we presented in some detail a number of crystal-controlled oscillators which we thought would be of interest to a considerable number of readers. This month, we are dealing with some self-excited oscillators, which, taken over all, should have a wide variety of applications.

By Ian Pogson — Part Two

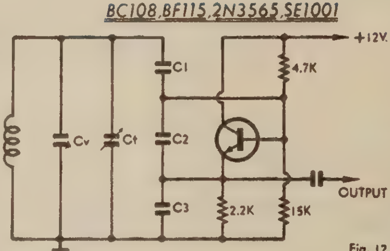


Fig. 12

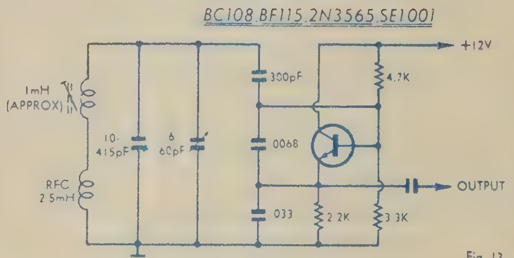


Fig. 13

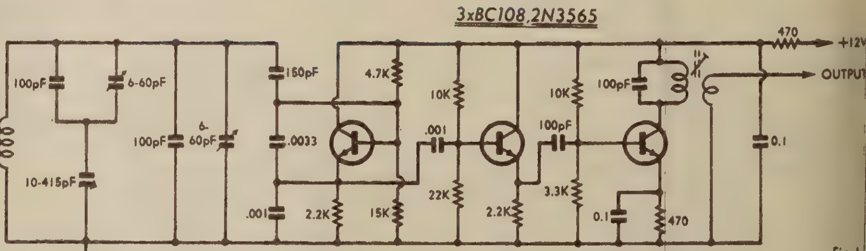


Fig. 1

As with the crystal-controlled oscillators, what follows is virtually a report of our findings, as far as we have gone to date.

One self-excited oscillator which appears to be as good as any which we have tried and which will oscillate over a wide range of frequencies is that which was described by Commander Paul H. Lee in "CQ" magazine. The general circuit is shown in figure 12.

Lee described the oscillator as a "Synthetic Rock" and went on to say that many transistor oscillators exhibit a peculiar instability in the form of a "burble" of about 5Hz about a stable mean frequency. Such a problem is avoided in this circuit and the excellent results are due at least in part to the fact that the transistor is connected across a relatively low impedance, involving the two large capacitors, C2 and C3, in the tank circuit.

In its original form, germanium transistors were used and the oscillator was designed to operate over the range from 4.9 to 6.1 MHz. Our investigations show that it is possible to achieve excellent results over the range from 100-KHz, up to 13MHz.

Incidentlly, it will be noticed that the VFO which was described recently is an adaptation of this circuit.

Let us begin at the circuit for the 100 to 150KHz oscillator. A separate diagram is given for this one, in figure 13, as it departs somewhat more from the standard circuit of figure 12.

As may well be imagined, large values of L and C are required for such a low frequency. The value of L in this instance is approximately 3.5mH and, as a matter of expediency, we made this up by using a good quality 2.5mH RF choke, in series with one winding of a standard 455KHz IF transformer. The slug in the latter is actually used to adjust the value of L as required.

The three capacitors forming a voltage divider across the tank circuit are 300pF, .0068uF and .033uF. The 300pF capacitor considered optimum for this case should always be kept as low in value as possible, consistent with reliable oscillation and reasonable level of output. The .0068uF capacitor also has a considerable influence on the amount of feedback and this is also set for optimum performance. This capacitor has an influence on the wave-form, as may be expected; the value nominated gives a clean-looking wave-form on the CRO. The .033uF capacitor also influences the feedback and wave-form, as well as the output voltage.

A single gang, 10 to 415pF variable capacitor is used to cover the tuning range. A trimmer, 6 to 60pF, is also needed, to adjust the frequency to 150KHz, at the minimum setting of the main tuning capacitor.

We made some checks on the stability of this circuit, using a silicon SE1001 transistor for the test. It is with some reservation that we quote that the measured drift over a period of one hour was only 2Hz. It may certainly be said with safety that the stability is very good indeed and this oscillator would be well worth considering as the variable element in a frequency measuring device.

A check was also made with a germanium transistor, type OC170, with due change to the supply polarity. It was found necessary to change the .0068uF capacitor to .012uF, all other values remaining the same. Measurements on this occasion showed a dr of about 17Hz in 45 minutes, becomi stable after this time.

Although these checks were only of short-term nature, it appears that t silicon transistor would be the bett proposition.

Before leaving the 100 to 150 KH circuit, we must point out that the ou put level is quite low, something of t order of 20 to 30 mV. This mea that the oscillator must be followed wi an amplifier if greater output is neede

In any case, the extra stage will he to isolate the oscillator from extern interference.

The next frequency at which our i terest rests is 455KHz. An oscillat on or near this frequency may be us as a BFO in a communications receive The frequency could be fixed, switche between two frequencies about 3KH apart for SSB reception, or it could made variable over a range of a fe KHz. This can be done quite easily well-established techniques. Anoth use for this oscillator could be to supp the carrier for the generation of a S signal.

In our oscillator we used a coil wi ing from a standard IF transform with the 100pF capacitor removed. ferring to figure 12, C1 is 100pF, C2 .018uF and C3 is .001uF. For C1 C3 we used silver mica capacitors for C2, a Styroseal.

Stability checks with this arran ment showed that the drift was of order of 3Hz over the first half-h with little if any more than a variat of 1Hz over the next half-hour.

We considered that the next hig frequency of interest could be 1M The secondary winding of an RF for broadcast receivers was used for inductance. Again referring to figure C1 is 150pF, C2 is .018uF and C .001uF. We have no frequency figures for this one, but we can see reason why the stability should not comparable with those already quo

For frequencies between 2.4 3.8MHz C1, C2 and C3 are set to pF, .0033uF and .001uF, respectivel coil with an inductance of the orde

is needed, with a variable capaci-
v, of a suitable value to give the
ency required. For the purposes of
hecks, we used a 10 to 415pF vari-
capacitor, which covered the full

next step in frequency takes us
13 MHz. We used a short-wave
as used in the older type of dual-
receivers. The same variable capa-
Cv, was used and C1, C2 and C3
made 100pF, .001uF and 470pF,
tively.

mentioned earlier, we have not
this oscillator above 13MHz.
ver, we can see no reason why it
l not be taken somewhat higher.
eaders who like to experiment along
lines we suggest that C1 be 33pF,
20pF and C3 220pF; the combined
le capacitor Cv, and the trimmer
riable over the range 20 to 120pF.
coil may consist of eight turns of
uge tinned copper, ¼in diameter
¾in long. With these values the
from approximately 20 to 30MHz
l be covered.

practical example of this circuit is
in the VFO which we
developed for an SSB
mitter, on which we are
ntly working. As can
en from the accompany-
icture, this unit is built
a die-cast metal box,
uring only 4⅝in x 3⅝in
3/16in. The circuit is
in figure 14.

though it is not our in-
on to go into full details
is VFO at the moment,
ef discussion should give
useful information to
rs who are interested in this type
'FO.

e oscillator, emitter follower and
ifier, all use silicon NPN transistors.
particular type as fitted in this unit
2N3566, which is a higher rated
on of the 2N3565. The particular
does not seem to matter—we have
used such types as BC108, BF115,
01 and 2N706, all giving much
ame results.

may be seen from the photograph,
ired most of the small components
a miniature tag board and this,
rn, is screwed to the bottom of the
The major components, including
scillator coil, tuning capacitor and
trimmers, are mounted directly to the box.

The output coil in the collector circuit of the amplifier is not included in the assembly of the unit, but is quite separate. It is mounted on the main chassis of the transmitter, adjacent to the VFO box. This arrangement is convenient for shortness of leads and there is just not enough room in the box for the coil assembly anyway!

The oscillator coil is wound on a ceramic former, one inch in diameter. The number of turns required to cover the range, 3.0 to 3.5 MHz, is 22, spaced to occupy approximately ¼in. The output coil is wound on a 5/16in slug-tuned former, which is mounted in a 13/16in square can. There are 60 turns of 33 SWG enamelled wire, close wound on the primary and 8 turns over the earthy end, for the secondary.

It will be noted that we have used a 10 to 415pF capacitor for the main tuning. This has in series with it, a 100pF silver mica and a 6 to 60pF trimmer in parallel. Also shunted across the coil, are another 100pF silver mica and a 6 to 60pF trimmer. This arrangement gives a very good linear tuning law, which is a desirable feature.

The three series capacitors, of 150pF, .0033uF and .001uF are all polystyrene types. The coupling capacitor from the oscillator to the emitter follower, is also a polystyrene type.

With the unit using the components just as described, we took the trouble to make frequency measurements of the drift in frequency. The following table shows the results which we observed, immediately from switching on and then for a period covering one hour and a half.

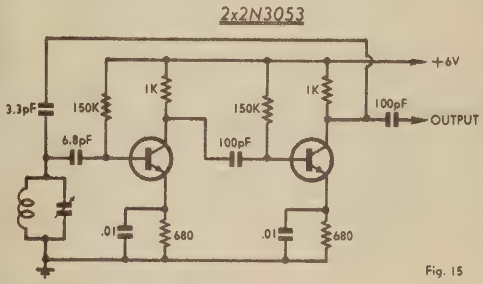
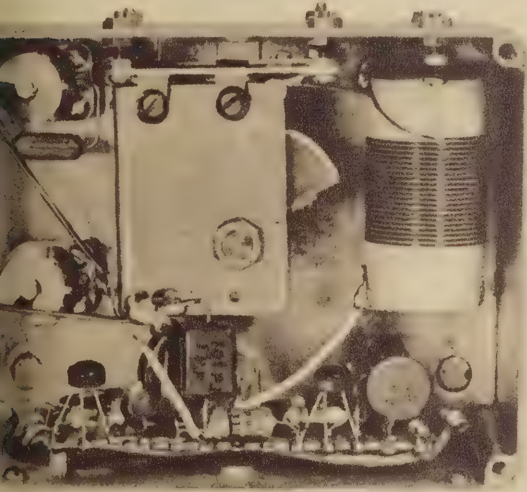


Fig. 15



The VFO is built into one of the Eddystone die-cast metal boxes. These are ideal for the purpose, ensuring rigid construction and so enabling good mechanical stability to be achieved. Although there is no spare space, all components are fitted without crowding.

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(14) Headphone Jack
(15) L-channel Tape Head Input
(16) L-channel Player Input
(17) L-channel Tuner Input
(18) L-channel AUX Input
(19) L-channel Recording Output
(20) L-channel Tape Monitor Input
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SENSITIVITY: AT 1 KC. RATED OUTPUT
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PHONO 3 mV.
TUNER, AUX, & TAPE MONITOR 400 mV.
TONE CONTROL: BASS 50 c.p.s. ± 14db.
TREBLE 10 kc. ± 11db.
LOW FILTER: — 8db. at 50 c.p.s.
HIGH FILTER: — 8db. at 10 kc.
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+ 8db. at 10 kc.
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REVIEWED IN APRIL, 1966, ISSUE ELECTRONICS AUSTRALIA

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Time Minutes	Drift Hz	Time Minutes	Drift Hz
0	0	50	63
5	25	55	67
10	28	60	72
15	32	65	73
20	38	70	75
25	43	75	76
30	49	80	78
35	53	85	80
40	56	90	82
45	59		

A study of these figures ws that of the 82Hz drift, r the 90-minute period, Hz of this occurred in the t five minutes. Indeed, ut 22Hz could be accoun- for in the first two nutes after initially switch- on. This order of per- mance can be considered quite satisfactory for gle sideband operation.

t may even be possible to rove on these figures and, ough we have not made further investigations ng these lines, we hope to so in the not-too-distant future.

Before we leave the subject of VFOs, ther interesting one has come to the ice of the writer. Although we have built one, we have had the oppor- ity to observe this one very closely. e oscillator is basically a transistor sion of the Franklin, which was de- oped by Bruce Glassop, VK2BG, ut two years ago. The circuit is wn in figure 15.

This oscillator appears to have two ent features, one very good and the er not so good. The good feature he apparent ease of obtaining high- quency stability. On the debit side, circuit is very sensitive to variations oading, which gives rise to frequency t of a serious nature. However, this er problem can be overcome.

n this particular case, the oscillator per of figure 15 is followed by two nsistor stages. The first is an-untuned fer and the second is an amplifier, n the collector tuned to the oscillator quency. The output voltage at this nt is of the order of four volts, which ufficient for most applications.

he frequency coverage is from 5 to 5MHz and frequency drift measure- nts have been taken against WWV on Hz. The drift over the first hour only 20Hz, with very little change m this point over the following hour. s interesting to note that the 2N3053 nsistors were fitted with small flag- e heat sinks. Without them, the drift about 30Hz in the first hour.

or readers who may wish to try this uit, here is a word of warning on the tter of using heat sinks for the transis- as quoted. The collector is con- ted to the metal shell of the transis- so the heat sink must not be wed to any metal objects, such as chassis.

o sum up, this VFO has been in use a SSB transmitter for the past two rs and it has proven itself beyond doubt.

arlier, when dealing with crystal llators, we touched on the bridge as shown in figures 7 and 8. We e made a few investigations into this uit as a self-excited oscillator. Un- unately, we have not taken these investigations as far as we would like, but we can report on what we have found so far.

We have had this circuit as shown in figure 16, oscillating over the range of approximately 20KHz to 100MHz—quite a wide range! The 20KHz was obtained with two 2.5mH RF chokes in series, as the inductance, in series with a .0027uF capacitor. Oscillation was vigorous and the wave-form rather "fruity," as viewed on a CRO.

At the other extreme, the maximum frequency of 100MHz was obtained with a coil of three turns, ¼in diameter and 1in long, in series with 20pF. Needless to say, the frequency may be made variable, by replacing the fixed capacitance with a suitable variable.

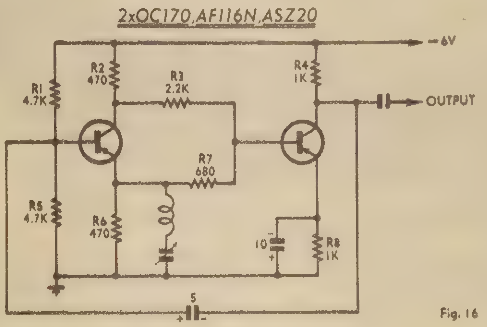

Fig. 16

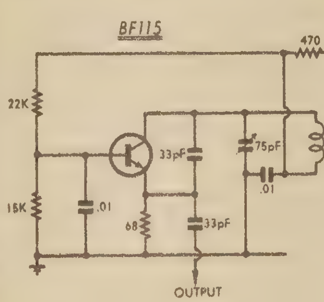

Fig. 17

From our experience, we found that the circuit required a minimum of series capacitance of about 18pF, otherwise it would drop out of oscillation. The circuit is very tolerant of high C and low L. In fact, we even eliminated the physical coil altogether and simply placed a capacitor, with its stock length leads, into the place of the LC circuit.

By way of an example, we connected a 33pF NPO ceramic into the circuit and it "took off" as usual. This particular characteristic of the circuit could be used to advantage where the resonant frequency of a capacitor, with a certain length of leads, is required. It would be necessary then, to have some means of measuring the frequency of oscillation but this should not present any great difficulty.

In between the two extremes of frequency noted, the possibilities of this oscillator could be very promising, particularly for a VFO, or the variable element in a frequency measuring device. Due to the fact that the circuit is not seriously affected by external influences, it should be possible to obtain very high stability.

It is hoped that in the reasonably near future, we will be able to make investigations along these lines.

The last circuit in our collection is shown in figure 17 and is intended for service in the lower VHF range. It will, of course, operate satisfactorily right across the HF range as well. It may be necessary under these conditions to increase the value of the emitter resistor by about 2000 ohms.

With the values as shown in the circuit and a coil of three turns, ¼in diameter and ¾in long, the approximate frequency coverage will be 40 to 80MHz.

So there it is. This list of transistor oscillators should keep most readers and experimenters going for some time.

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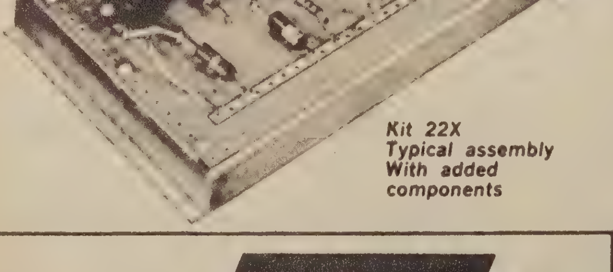
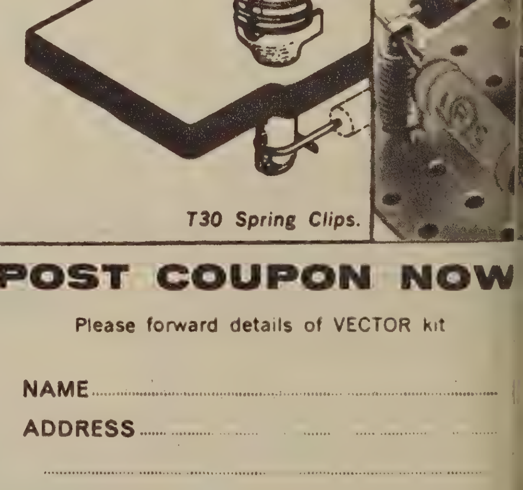


Kit 22X Typical assembly With added components



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V/67

lectronic Flash—Transistor ower Supply

llowing last month's broad discussion on ctronic flash, here is the first part of a prac-al constructional article. A transistorised wer supply, constructed on a printed board, is a simple enough project for almost any-e who can handle a soldering iron. This icle tells you how to make it and test it.

By Philip Watson

s mentioned in last month's article, are currently working on a complete toflash unit, based on a transistorised ver supply developed by Mr John gfoot of Philips' laboratory. We made initial test on a unit kindly supplied Philips, but have since constructed a licate unit in order to determine ctly what was involved in the job and pinpoint any problems likely to be ountered by our readers.

irst, however, we should point out there are several possible variations the power supply. Mr Longfoot eloped two basic supplies: One to k up to 50 joules and one to work up 100 joules. Both designs use the same uit and the same wiring board, but er in the size of the transformer, the ie of some resistors, and the types of nsistors.

he 50 joule unit has the advantage of g a physically smaller transformer should also cost less to make. It ld be ideally suited to an application re small size is the main considera-, and it may even lend itself to the -in-one" type of unit which we illus-ed on page 63 of last month's issue. hope to take a closer look at this sibility later on.

here are also two types of trigger cir- suggested by Mr Longfoot. One is airly conventional arrangement; the other uses a thyristor to reduce the amount of current through the camera contacts—an important consideration if long life and reliable operation is to be obtained from these.

Finally, there is an alternative mains power supply cum battery charger which can be incorporated if desired. As well as keeping the battery charged, it permits operation directly from the mains when this is convenient.

Naturally, the individual will have to make up his own mind which combination of these units will suit him best, or whether he wants to incorporate all of them now or leave some till later.

For the moment, we intend to concentrate on the basic 100 joule power supply, without the addition of any refinements. Later, we will discuss these in greater detail.

The power supply is a fairly standard arrangement in the realm of transistor power supplies, but some features of the circuit and components are worth discussing in detail.

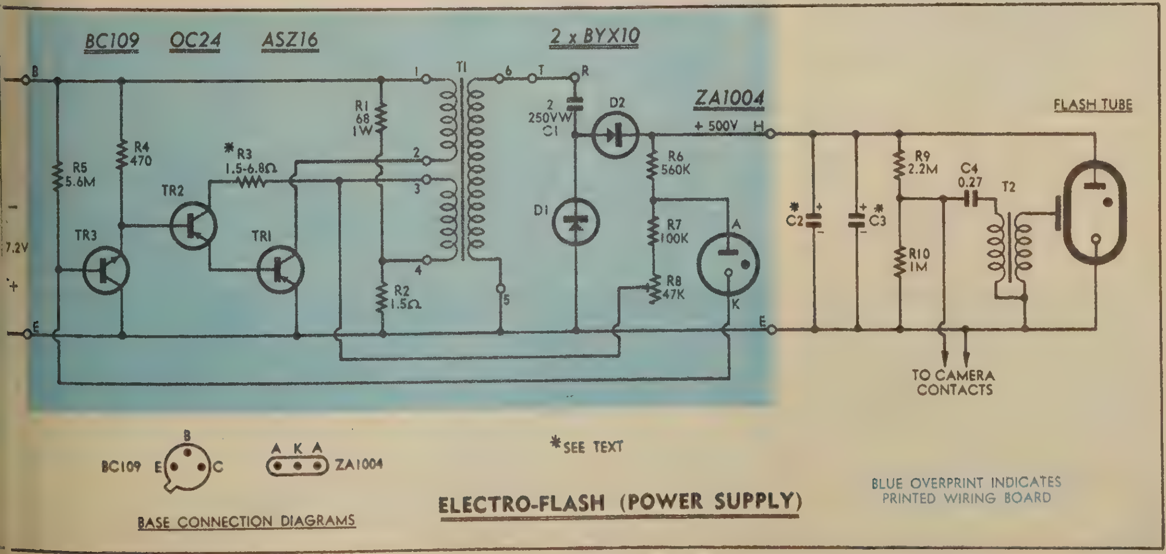
The supply is designed to operate from six nickel-cadmium cells or, at a nominal voltage of 1.2V per cell, 7.2V. Used in conjunction with a simple voltage doubling circuit, it will develop at least 500V, although the exact voltage can be readily adjusted to suit available electrolytic capacitors.

To get an idea of how the circuit works, consider first the transformer primary winding (terminals 1 and 2), the battery, and the transistor ASZ16. Starting at the negative terminal of the battery we can trace a current path to terminal 1, through the winding to terminal 2, to the collector of ASZ16, thence to the emitter, and finally to the positive terminal of the battery.

Thus we have a current path from the battery, through the transformer primary, through the transistor, and back to the battery, and if we interrupt this path at some suitable frequency, we will generate an alternating voltage across the secondary winding (5 and 6) stepped up by reason of the larger number of turns compared with the primary.

The interruption of the primary current is provided by making the ASZ16 function as a blocking oscillator, the necessary feedback being provided by

This is the circuit of the complete flash unit, with the power supply portion, as accommodated on the printed board, shown in the blue panel. The power supply construction is discussed in detail this month.



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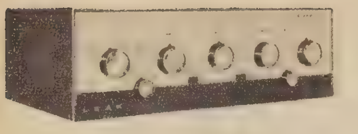

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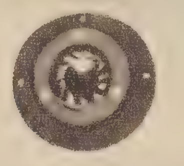

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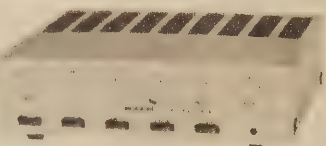

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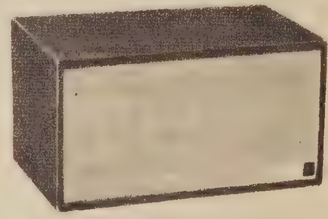

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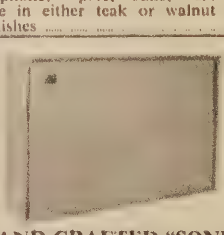

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A wide range of "Sonics" speaker systems is now on display at Encel Stereo Centres . . . and individual prices are as low as **$19.** For the budget conscious music lover or for the tape enthusiast who wishes to up-grade speaker quality, "Sonics" offer unusually good value. Cabinets are hand finished in oiled teak or walnut veneers. Model AS302 features a 12" bass reproducer and a horn type tweeter with variable brilliance control . . . **$47 (£23/10/-).** Model AS-60 two speaker system . . . **$25 (£12/10/-).** Model AS-41 3 speaker system — 2 woofers and a tweeter . . . **$31 (£15/10/-).** Several others in stock. Come to your nearest Encel Stereo Centre and hear the "Sonics" range!

SILK DEPARTMENT STEREO SYSTEM FROM ENCEL ELECTRONICS!

If worldly goods are no problem, this Encel Stereo System can be very satisfying! Compare this value . . .

AKAI AA-5000 solid state stereo amplifier (or ADC-60 solid state stereo amplifier), ORPHEUS SILEX turntable with MICRO MA-77 tone arm and ORTOFON stereo cartridge fitted with elliptical diamond stylus, two Leak "Sandwich" speaker systems. ENCEL PRICE **$590** **£295.**

Supplied with a LEAK "Stereo 30" solid state stereo amplifier and two KEF "Celeste" speaker systems . . . in place of the Akai/ADC-60 and "Sandwich" systems, price tumbles to **$480** **£240.**

Hear this splendid system at Encel Stereo Centres in Melbourne or Sydney. P.S. Encel prices include Sales Tax

ASK FOR AKAI PRICES!

ALL AKAI models are in stock . . . M8, X4, 355, X1000D and 1700. Encel trade-in prices and end-user EMQ's are more than just attractive, too!

EXCLUSIVE ENCEL OFFERS FOR OCTOBER

1. The popular new Encel-Nikka tone arm with a Micro 2000/5 magnetic stereo cartridge, Labcraft 605 transcription turntable. **$72**
2. Goldring GL99 transcription turntable, Encel-Nikka tone arm, Micro 2000/5 magnetic cartridge. (With Silex ...... **$85**) **$89**
3. Roland FAX-150 stereophonic amplifier with AM/FM tuners, Connoisseur turntable, Connoisseur SAU-1 tone arm with lift, Connoisseur stereo diamond cartridge, two Wharfedale 10" RS/DD speakers. **$199**
4. The ideal budget system. Planet MG1504 stereo amplifier (8 watts I.H.F.M. per channel), Connoisseur turntable, Connoisseur tone arm w/lift and stereo diamond cartridge, two 8" RS/DD Wharfedale speakers . . . **$138.** With a Labcraft 643 turntable and a B & O stereo diamond cartridge in place of the Connoisseur group price is only **$128**
5. Sansui Model 220 stereophonic amplifier with AM/FM/SW tuners, Connoisseur Craftsman transcription turntable, Ortofon SMG 212 tone arm and Ortofon SPU-GT-E elliptical stylus cartridge, two Celestion CX 1512 12" co-axial wide range loudspeakers **$350**
6. Leak "Stereo 30" Akai 5000 or ADC 60 solid state stereo amplifier, Orpheus Silex turntable, Micro MA77 tone arm, ADC 10E elliptical stylus cartridge, two Celestion CX 2012 co-axial speakers. (The arm was reviewed in "Electronics", April, '66 !). Encel price only **$450**
7. The new Encel CSM-40 stereo amplifier, Labcraft 605 or JH turntable, JH MkII or Encel-Nikka tone arm, ADC 770 or Micro 2000/5 stereo diamond magnetic cartridge, two twin cone Wharfedale 10" RS/DD speakers ...... **$219** (With the new COSMOS SW-30c stereo amplifier **$159**

Make up your own combinations . . . of any components you wish . . . and write for an EMQ. Encel prices are the LOWEST in Australia . . . and the service at Encel Stereo Centres is the best!

EARLY ENCEL SPECIALS AVAILABLE!

The special offers made from time to time by Encel Electronics in "Electronics Australia" are often kept open for several months. In many cases, the prices quoted are still applicable. Please check with us!

Encel Electronics Pty. Ltd.

Head Office: 431 Bridge Rd., Richmond, Vic. Tel. 42 3762
City Branch: 18 Bourke St., Melbourne. Tel. 32 2672
Sydney Store: 257 Clarence St., Sydney. Ground Floor, 25M Building Tel. 29 4563, 29 4564

Australia's Greatest Hi-Fi Centre

Wholesalers
Trade-ins accepted

e feedback winding (3 and 4) which, ectively, is connected between the SZ16 emitter and base. However, the nnection to the base is via R3 and the llector/emitter circuit of Tr2 (OC24), that the amount of feedback will pend on the forward bias applied to 2.

Throughout the major portion of the arging cycle, Tr2 is biased, by means R4, so that it is saturated and offers tle opposition to the feedback signal. the same time, and in order that Tr2 n be so biased, Tr3 must be cut off. is condition is a function of R5, the on tube ZA1004, and the tapping be-een R6 and R7.

Normally the neon tube is non-con-cting but, as the main storage capacitor proaches full charge, and the voltage ross it approaches the desired cut-off ure, the voltage at the junction of R6 d R7 reaches the striking voltage of neon (about 85 volts).

When the neon strikes, it provides a rrent path through the base of Tr3 ich amounts to forward bias for the ter, which then conducts. When it does, diverts some of the current previ-sly flowing through Tr2 base, via R4, lucing the forward bias so that Tr2 is longer saturated. The additional resi-nce between the feedback winding and l base reduces the effective feedback l its peak collector current. It also in-ases the blocking oscillator frequency.

Thus, once the neon strikes we have eedback loop which reduces the acti-y of the oscillator as the voltage across main storage capacitor rises, or in-ases it as the voltage falls. In practice, system settles down to a balanced ndition whereby the oscillator operates just the right level to maintain the acitor at the selected voltage and ply the current needed by the vari- bleed networks and the capacitor's n internal leakage.

n practice, the scheme works extreme- well. Because the feedback loop is perative until the neon strikes, it has retarding effect on the charge rate over greater portion of the cycle, thus wing the system to work at its best sible speed. The neon strikes when capacitor is charged to within about volts of the selected terminal-voltage. is obviously passing only a small ount of current at this stage, and re is little effect on the charge rate.

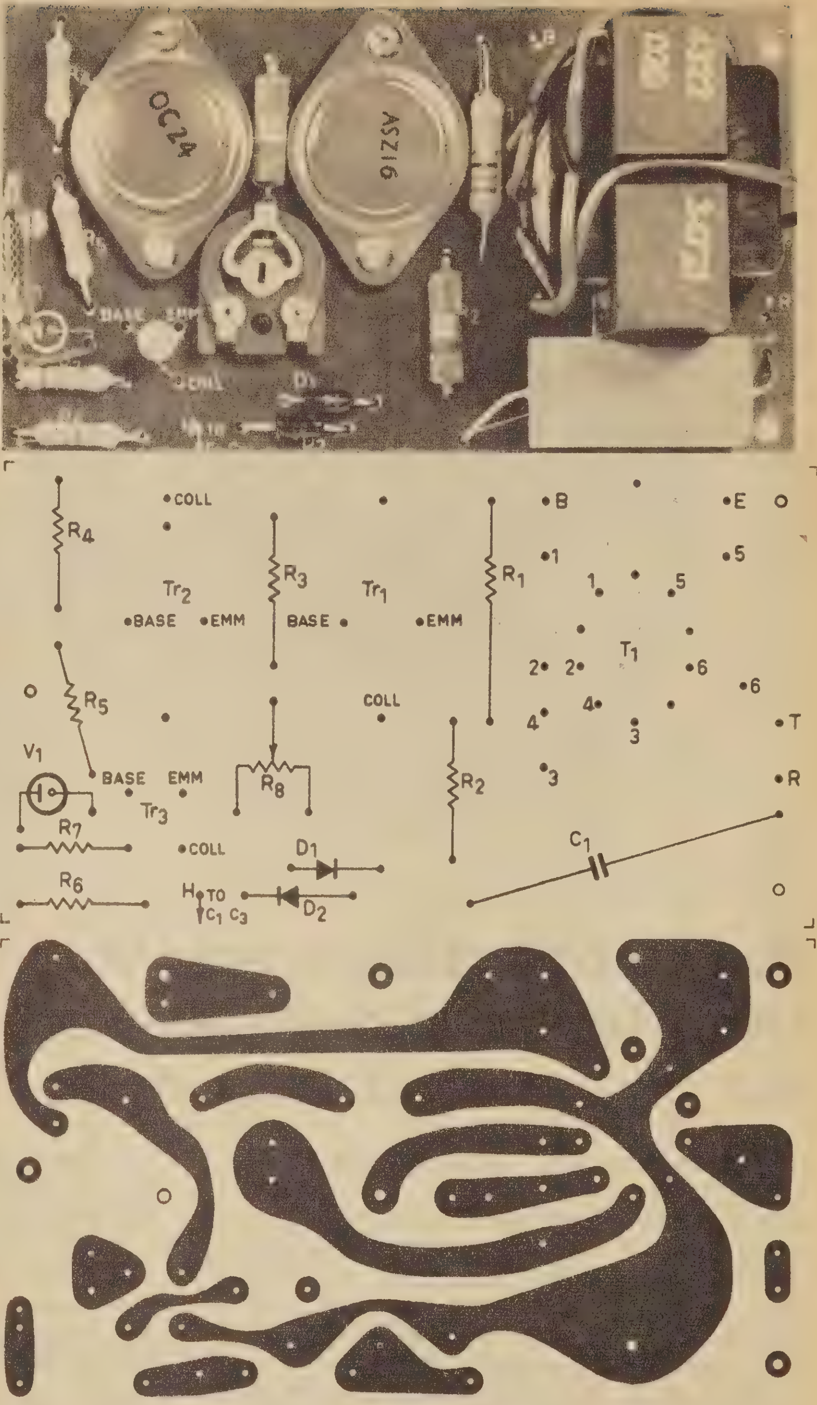
Iowever, as the brightness of the n increases and more current is pass- the feedback action comes rapidly operation, and the voltage ceases te abruptly to rise as the selected age is reached. This kind of action sts in providing short charging times, e the power supply can be designed "aim" at a higher voltage than that ired, thus working over the ighter portion of the capacitor's rging characteristic, and maintaining latively high rate of charge right up he shut-off point.

he actual voltage at which the system can be adjusted by means of R8. is also a very valuable feature, e it may well transpire that the trolytic capacitors most readily lable will be 450 volt types, rather the 500 volt types envisaged when unit was designed. Using samples of capacitors, no difficulty was experi-d in setting the supply to this figure, which it behaved identically in all r respects.

owever, some modification may be required to this part of the circuit if it is desired to provide a "half power" position in the final flash unit design. If this is to be achieved by reducing the voltage—and there are a number of advantages to this approach, which we will discuss later—the easiest way to do this is to provide an alternative network for R7, R8, which can be switched in as required. This may mean some change to the existing values of these components, but should involve very little additional cost. In the circumstances it would seem best to build the board as shown for the time being and until the final form of the complete unit is known.

One of the secrets of this circuitry is to use a neon tube with only a small differential between its firing and maintaining voltage, and the ZA1004 has been specially selected for this reason. In addition, it will be noted that the divider network R6, 7, and 8 does not return directly to the "earthy" rail of the circuit, but instead to terminal 3 of the transformer.

In the DC sense this point is close



The top photograph shows the layout of a finished board. Below it is the code pattern on the printed wiring board, used to indicate the placement of components. Compare these two with each other and the circuit on page 57. At the bottom is the printed wiring pattern.

PLESSEY

Hi-Fi enthusiasts select the Plessey Loudspeaker for compact stereo systems

If you appreciate the fine reproduction of sound you will certainly understand why Plessey has so much to offer. In the Rola C8MX 8 inch loudspeaker Plessey provides remarkable flexibility; the frequency range is from 40 Hz to 12 kHz and it has real power handling capacity — up to 16 watts peak!

Mounted in the Rola designed "Slimline" enclosure, the C8MX provides exhilarating performance. And it's compact; the true space saving characteristics of this enclosure will be valued by all who appreciate simplicity of design.

A new feature is an 8 ohm voice c impedance now available with the ohm model. This new impedance mak the C8MX even more versatile.

For further advice on applications this fine speaker, plus constructi details for the enclosure, contact y nearest Rola distributor, or apply ectly to

Plessey Components Group
Rola Division
The Boulevard Richmond E1 Victo
Melbourne 42 3921

Plessey Components Group
Rola Company (Australia) Pty Ltd
The Boulevard Richmond E1 Victoria 42 3921
NSW Plessey Components Group Rola Division Box 2 PO Villawood Telephone 72 0133

ough to the earthy rail such as not effect the behaviour of the network any extent. However, the presence the transformer winding in series with divider network introduces small tage spikes, of about six volts ampli-le, and of such polarity as to assist firing of the neon diode earlier in charging cycle, by this value of volt-. Since this voltage is similar to the ferential of the neon itself, the latter nctions very much as though it had differential at all.

A secondary role for the neon is, rly obviously, as an indicator that main storage capacitor is fully arged. Thus, although it may be ounted directly on the board during ting, it may need to be extended m this point to a more convenient e when the unit is built into complete uipment.

A word of caution is offered here. r anyone who is tempted to build ch a power supply before capacitors available to go with it, it should be ted that the supply should never be erated without some form of capa-ive loading. Very high peak voltages generated by the blocking oscillator, rticularly during the "switch-off" tion of the ASZ16. These can equal veral thousand volts, and could easily mage the transformer winding or sociated components.

If the unit is to be tested it is a od idea to substitute a small electro-ic capacitor, or even a large paper e, for the main storage unit. This o has the advantage that the energy red is not likely to be dangerous — important point when experimental rk or testing is in progress.

In the event that the main storage pacitors are available, extreme care uld be taken in handling them. These pacitors store a considerable amount energy, have a very low internal im-lance and can easily deliver a lethal ock. This applies even after they have n disconnected from the circuit for ne time.

Do not leave them lying around on bench in a charged condition. Dis-irge them through a bleed resistor nected to suitably insulated prods.

Do not discharge them with screw-ver blades or similar "dead shorts." is not good for the capacitors, it is good for screwdriver blades, and it not good for the nerves. There ld also be a risk of flying particles molten metal.

Do not indulge in practical jokes with se capacitors.

A logical follow-up to the assumption t the main storage capacitors are ilable is to assume that a flash tube y also be available, and this suggests ther word of warning. If you are pted to mock up a circuit on the ch, do not connect the flash tube ctly across the main storage capaci-. Without some resistance in circuit, h as is normally provided by the feet of cable between the main unit the head, the tube can quite easily overloaded, as evidenced by blacken-around the electrodes and/or crazing he glass.

In its practical form the power ply is constructed on a printed wiring rd measuring 2½in x 4½in. The ern for the board is shown here at least one manufacturer has gone production and they should be readily available by the time this article appears. These will be printed on the reverse side with symbols and component numbers to assist the builder, and assembly should be a simple job, even for the relatively inexperienced.

A few points are worth noting, however. Some of the first boards produced have only one mounting hole punched for Tr2, although the position for the second hole is shown. Unfortunately, this may be slightly off centre and also is rather close to the printed pattern running to the base. There is a risk, therefore, that a mounting bolt fitted in this position may short the collector to the base. Since one mounting bolt should be adequate, it would be wiser to omit the second bolt in such cases.

Alternatively, if you feel fussy about it, you can trim the appropriate portion of the copper pattern with a razor blade, so that it clears the nut. We did this on one of our experimental boards, just to prove that it could be done, and experienced no difficulty. The manufacturers of the boards have been advised of this situation, and later production runs should be corrected.

PARTS LIST

1 Printed wiring board 2½in x 4½in.
1 Transformer (see text).

RESISTORS

(½W, 10 p.c. unless otherwise specified.)
1 1.5 ohm.
1 6.8 ohm (see text).
1 68 ohm 1W.
1 470 ohm.
1 47K ohm tab pot to suit wiring board (see text).
1 100K ohm.
1 560K ohm.
1 5.6M ohm.

CAPACITORS

1 2.2uF 250V polyester capacitor.

TRANSISTORS, ETC.

1 BC109.
1 OC22, OC23 or OC24.
1 ASZ16.
2 BYX10 diodes.
1 ZA1004 neon diode.

MISCELLANEOUS

Nuts and bolts for mounting transistors. Araldite for mounting transformer. Hook-up wire for leads. Solder, etc.

Note also that the ZA1004 neon is a polarised device, and must be connected the right way around. The device has three leads, the two outer ones being common and connecting to the anode or positive electrode. The centre lead goes to the cathode.

The board is made with provision for a switch between pin 6 of the transformer and C1, this being useful in some arrangements where alternative mains operation is provided. For the time being, however, these two points, marked "T" and "R" on the edge of the board, should be simply strapped together.

In any switching arrangement which may subsequently be used involving these two points, care must be taken to see that it does not, in any possible circumstances, allow these two points to become open, even momentarily, while the ASZ16 is functioning as an oscillator. Otherwise the transformer secondary will be unloaded, with the dangers already discussed.

By the time this article appears, commercially made transformers should be available from at least two manufacturers. However, we are publishing the winding data, as supplied to us by Philips, for the benefit of any readers who may not have ready access to these, or would prefer to wind their own for any other reason.

Commercially available transformers may vary in the mounting facilities they provide and, in any case, there is a difference between the mounting of the smaller (50 joule) pot core type transformer and the larger (100 joule) "E" core type.

Provision is made on the printed board for both types, and accounts for the duplication of terminal number markings. The larger transformer could be mounted by means of a conventional "E" core clamp, but it is most likely to be supplied without this and for direct mounting on the board with a suitable adhesive, such as one of the epoxy resins (Araldite etc.) The arrangement was used in the prototypes quite successfully.

The two larger transistors can be mounted only one way on the board, so there is no problem about connections. The collector connection is made via the transistor case and mounting bolt, leaving only the base and emitter connections to be soldered. Clip the leads to a suitable length and solder them to the board.

In the case of the BC109 (Tr3) the flying leads will need to be identified by the constructor. We have shown the lead configuration for this transistor on the circuit diagram, as seen when looking at the underside of the case.

With this, or any transistor, care must be taken when soldering the leads, that excessive heat is not applied, since it can damage the transistor. Normally,

RESISTOR COLOUR CODE

Value	1st Band	2nd Band	3rd Band	4th Band
1.5 ohms	Brown	Green	Gold	Tolerance Band
4.7 ohms	Yellow	Purple	Gold	Gold 5%
6.8 ohms	Blue	Grey	Gold	Silver 10%
68 ohms	Blue	Grey	Black	No band 20%
470 ohms	Yellow	Purple	Brown	
100K ohms	Brown	Black	Yellow	
560K ohms	Green	Blue	Yellow	
5.6M ohms	Green	Blue	Green	

Some plain talk from Kodak about tape:

SENSITIVITY, FREQUENCY RESPONSE and Kodak Sound Recording Tape

Controlling every electrical factor involved in the making and using of sound tape is a bit like trying to watch a three-ring circus . . . it can be done, but you need fast eyeballs. To give you a picture of a few things that need looking after, it might be a good idea to list the factors as a group and then go over them one at a time. They are:

High-Frequency Sensitivity
Low-Frequency Sensitivity
Frequency Response
Print-Through
Undistorted Output
Modulation Noise—Low Frequency
Signal-to-Noise Ratio — H.F.
Signal-to-Noise Ratio — L.F.
Saturated Output

Sensitivity means the same in tape technology that it does under any electronic condition: the degree of output for a given input. We put in a 400-cycle signal and measure the output. The result is low-frequency sensitivity.

We choose 400 cycles for a number of good reasons. Let's do a little arithmetic. A 400-cycle note recorded at 15-inches-per-second gives us a wave length that the tape "sees" of roughly .0375 inches, and by a happy coincidence this wave length penetrates the entire depth of the oxide coating, but not the support material. Why must the wave penetrate the entire coating for a low-frequency test? Simple, everything else being equal, low-frequency response is a function of the thickness of the coating. The thicker the coating, the better the bass response. If you want a tape that is flat way down low, then we have to test at a frequency that penetrates the entire coating. We choose 400 cycles instead of, let's say, 20 cycles because the 400-cycle note tells us just as much — and has an added advantage. An engineer can hear 400 cycles. So we have audio monitoring, as well as instrumented observation on the face of a scope.

Just as the low-frequency sensitivity test gives us an idea about oxide thickness, the high-frequency test gives us a fairly accurate picture as to just how smooth the surface of the tape is. Good high-frequency response is impossible on a tape having a rough surface. For one thing, high frequencies affect fewer oxide particles. If the tape surface is rough, the low points will represent gaps in the oxide and cause a loss of H.F. response. We test our high-frequency sensitivity at 15,000 cycles. At 15 ips this gives us a recorded wave length of 1 mil (.001 inches).

Now at this high frequency (short wave length) we are getting a skin effect. We are recording only on the surface of the tape. If any roughness is present, big troubles result. For example: If you have a surface condition where the amplitude of the roughness is just .0001 inches, you will lose 5.5 db in high-frequency response! While you are recovering from that startling bit of news, let's re-phrase the catastrophe. It takes a surface variation of just one ten-thousandth of an inch to knock down high-frequency response by a factor of almost four!

If you haven't suspected it up to now, we are working toward making a vital point about tape technology. And here it is: Kodak Sound Recording Tape has a surface that is unsurpassed in smoothness. Surface smoothness for Kodak tape varies no more than 25 to 50 millionths of an inch from a theoretically perfect plane. That's smooth!

A frequency response calculation
merely the arithmetic subtraction
high-frequency sensitivity from lo-
frequency sensitivity. Ideally the
sponse is zero because we want
hear all the vigor and nuances
the original. Of course, frequen
response is the product of the
sponses of the microphone,
recording and reproduce circu
and the tape. Our objective as
tape manufacturer is to give y
enough output at all frequencies
that you can achieve flatness wit-
out straining the noise and dist-
tion levels of your components.

It's quite an easy matter to jug
the characteristics of the oxi
around so that frequency respo
is nice and flat. For instance, if yo
oxide has poor high-frequency se-
sitivity, you can reduce the thic-
ness of the oxide layer. This w
degrade L.F. sensitivity, and th
effect a flat response. But is the r-
sulting L.F. loss worth it? We do
think so. That's why we design
our coating to give us superior lo
and high-frequency sensitivities,
well as a nice flat response.

KODAK
SOUND RECORDING TAP
Extra Play
21P

Kodak Sound Recording Tape in
complete range of types and lengt
is available at your nearest Kod
Branch.

KM1272

Magnetic Products Sales Division, KODAK (Australasia) PTY. LT

ing leads should be left at their full gth and all normal precautions taken see that the parts involved are clean l ready to solder with one application heat. If a joint fails to "take," stop l find the cause; don't try to brute ce it with prolonged application of at. Where flying leads are involved, se may be gripped with a pair of g nose pliers, to act as a heat sink and ay the rise in temperature.

The two BYX10 diodes must be con- ted with correct polarity, but this is arly shown on the board with a sym- similar to that which will be found nted on the units themselves. The ne soldering precautions should be erved as for the transistors.

The potentiometer, R8, is a tab type ended for adjustment with a screw- ver. The board is designed to take a ilips Trimpot type E097 AD47K, ich has three terminals arranged in a ngular configuration, but other types ld be accommodated with a little enuity if the original type is not ilable.

For the rest, the wiring of the board ounts to little more than mounting various resistors in accordance with "R" numbers shown on the board, ping the leads to an appropriate gth, and soldering them to the copper tern. Resistors are identified by a tem of colour coded bands, and we reproducing a copy of the code where in the article for the benefit readers more skilled in photography n electronics.

A little care is necessary when solder- to printed wiring boards. These will nd a normal amount of heat such is needed to make a joint, but the lication of prolonged heat, as might ur if the solder fails to "take" im- diately, can cause blistering of the e material and lifting of the copper tern. Make sure all wires are bright l clean and that the soldering bit is l tinned and free from pitting.

When everything is assembled and ed, the board can be tested. For you will need either the nickel- mium battery with which the unit o be used, or some temporary sub- ute which will deliver between seven eight volts and has a reasonably internal resistance. The battery is nected to points "B" and "E" on the rd and particular care should be en to observe the correct polarity. not actually connect the battery il a capacitive load has been pro- ed for the output.

For test purposes this load should be electrolytic capacitor of 8 to 16uF, V working. It is connected between nts "H" and "E" on the board, with regard to polarity. Connect a meter oss the capacitor, capable of reading east 500V, and switch in the battery. voltage across the capacitor should rapidly, and reach its maximum in uple of seconds.

According to the setting of R8, the 1004 neon will strike when the volt- reaches some value around 500V, at ch point the voltage will cease to . R8 may then be adjusted so that voltage is correct for the types of n storage capacitor to be used.

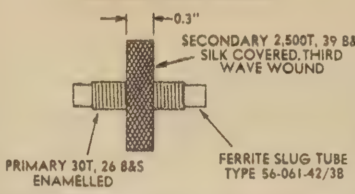
will be noted that R3 is given as ying from 1.5 to 6.8 ohms, and actual value will need to be selected an experimental basis. The purpose R3 is to limit the peak collector current in the ASZ16 to the maximum permissible value of 10A, as quoted by the manufacturers.

This value also effects the recycling time. The smaller R3 the shorter the time, but the larger the peak current through the ASZ16. To keep within the 10A limit, it is necessary to restrict the recycling time to about 15 seconds for a 100 joule system and, in the absence of a convenient means to measure the peak current, the home constructor is advised to select R3 on the basis of a 15-second recycling time. During any preliminary tests when only small values of capacitance may be used in place of the main capacitor, it would be wise to use the larger value of 6.8 ohms.

Some experimenters consider the 10A peak current value for the ASZ16 to be unduly conservative and we know of at least one who has omitted R3 completely to produce a recycling time of 10 seconds. However, anyone contemplating such a modification must be prepared to take the risk that, in the event of transistor failure, the makers could not be expected to accept any responsibility.

A safer arrangement, though less convenient, would be to provide a switch which would reduce or remove R3, for use when the battery is partially discharged and likely to increase the recycling time. Provided this does not reduce the time below 15 seconds, there should be no serious risk of transgressing the transistor rating.

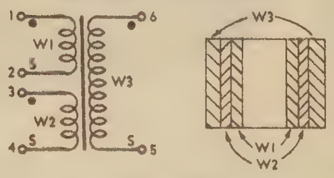
TRIGGERING TRANSFORMER



PROTOTYPE SECONDARY WOUND ON 'DOUGLAS' WAVE WINDING MACHINE, GEAR RATIOS:

E	F	A	B	C	D	$\frac{X}{X-1}$
30	90	48	32	31	46	$\frac{93}{92}$

OSCILLATOR TRANSFORMER



50 JOULE UNIT

CORE	WINDING
CORE P36/22 POT CORE	W1, 37T - 21 B&S
CORE TYPE K3 003 91	W2, 17T - 26 B&S
COIL FORMER P5 055 86	W3, 1,230T - 35 B&S
CONTAINER B1 410 52	
SPRING B1 480 24	
TAG PLATE P4 057 30	

100 JOULE UNIT

CORE	WINDING
E-CORE TYPE 56-907-49/3E1 (.02" AIR GAP)	W1, 54T - 19 B&S
	W2, 35T - 30 B&S
FORMER VA-901-21	W3, 1,890T - 33 B&S

Winding details, from the Philips laboratory, for the trigger transformer, and the 50 joule and 100 joule oscillator transformers. Commercial versions of these units should also be available.

The foregoing covers most of the points concerned with constructing the power supply. Before this can become a complete flash unit we have to consider the main storage capacitors, the triggering circuit, the flash tube, the reflector, the batteries, and a suitable case to hold all these items.

We should also consider the alternative methods of providing "half power" operation, the advantages and disadvantages of both, and what they entail in terms of circuit modification, switching, etc.

All these points, together with discussion on the availability of the less common items, we hope to cover in next month's article. In the meantime, those who want to go ahead can start on the power supply and should have it working by the time we are ready to consider the next stage.

All the components needed for the power supply should be available from trade houses by the time this article appears in print. However, in the event that the unusual items should not be immediately recognised, we suggest that dealers contact the following firms:

TRANSFORMERS

R.C.S. Radio Pty. Ltd., 651 Forest Road, Bexley, N.S.W.

Telecomponents Pty. Ltd., Mitchell Road, Brookvale, N.S.W.

PRINTED BOARDS

R.C.S. Radio Pty. Ltd., 651 Forest Road, Bexley, N.S.W.

Precision Windings, 52 Cambro Road, Clayton, Victoria. ■

STEREO EQUIPMENT CABINETS

New 1965 models are now available. Can be supplied in "make it yourself" kits.

MODEL 158

Designed to accommodate all popular amplifiers and players. Size: 34in wide, 9in high (front opening 6in high), 16in deep, 15in removable legs.

Price for Maple Veneer:

	£	s	d
Made and polished	£17	10	0
Packing		6	0
Kit of parts	£11	0	0
Packing		4	0
Teak veneer, extra	£2	2	0

Free on rail.

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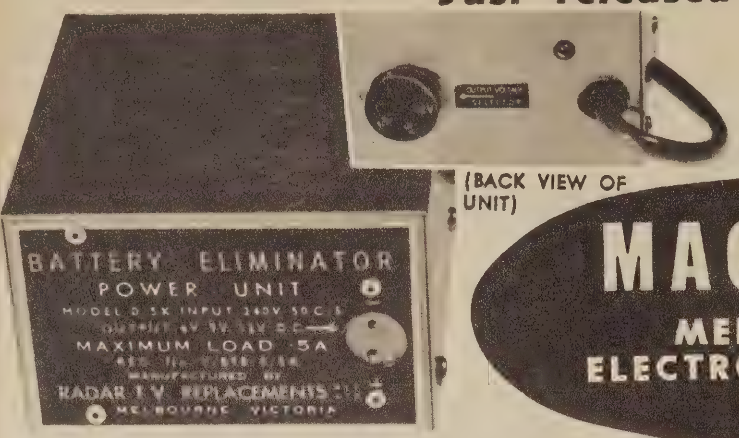
H. B. RADIO PRODUCTS

Manufacturers of Quality Radio and Radio Furniture for 36 years

103-105 Catherine Street,
LEICHHARDT, SYDNEY.
Telephone: 56-5580

Just released! NEW POWER SUPPLY UNIT RADAR 05X



(BACK VIEW OF UNIT)

MAGRATHS

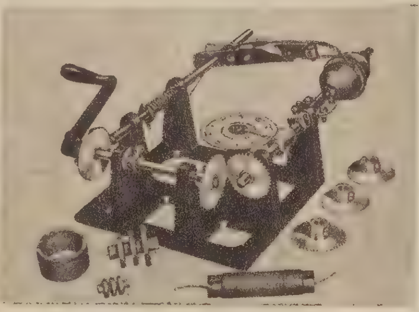
MELBOURNE'S
ELECTRONIC HOBBIES
CENTRE

The 05X is designed to operate the majority of ELECTRONIC APPLIANCES such as:— Transistorised Tape Recorders, Radios, Record Players, Small Amplifiers, Radiograms, Battery Shavers, and all Battery operated units of 6 Volts, 9 Volt and 12 Volt at a maximum current of .5 amps. This is the only unit available incorporating these 3 power outputs. This unit features Full Wave Bridge Rectification with Capacitor and Choke Filtering. Select your Voltage requirement by adjusting the Selector Switch then plug into any power point, 220 to 250 Volt A.C. The cost of operating is only 1 cent per 100 hours, thus saving many dollars on your Battery purchases. The 05X can be used also for Car Batteries as a Trickle Charger.

$16.50

Including Sales Tax and Postage

NEW MODERN *Coilmaster*



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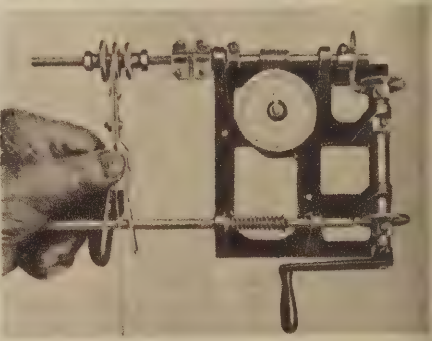

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HERTZ—"Such a lovely Germanic ring"

This is one of those months when it is virtually possible for our "Forum" Editor to take a holiday and let the letters speak for themselves — or almost so! So we present, with a minimum of comment, letters on a variety of subjects, beginning with one about our recent substitution of "Hertz" for "cycles per second."

Conducted by the Editor

ear Sir,

would like to buy an argument on the ubject of your recent change from cycles" to "Hertz." There appear to e more reasons against the adoption f the name "Hertz" than there are for .

From a commercial point of view, anufacturers in all English-speaking ountries have for decades been making quipment that is calibrated in cycles or ultiples of it. Change to Hertz will ake all the frequency dials of this quipment virtually obsolete. Manufac- urers will be forced to change their tool- g for dials, stock now held will need be modified and they might even be wamped with requests to change existing quipment to the new convention — all ighly inconvenient and costly. It is ertain that a mixture of instruments alibrated in Hertz and cycles will persist r years.

Thus I can only wonder at the motives f the American Bureau of Standards. id they change over in the name of niformity? If so, they considered only alf the problem.

A reason given is that it is "one more ep toward a truly international techni- al language." Might I ask, why does verything have to be so international? id they change to "Hertz" because cycles" sounds too English (or Ameri- an)? If so, then by the time the "in- rnationalising" process is through, elec- onics will not know itself for new ames. In any case, "cycles" is known nd understood all over the world, and ay be considered "international" in its wn right.

It is even possible that the regular advertisers in "ELECTRONICS Australia," having just gone to the trouble of changing over to decimal currency, might not be too pleased at having to change their copy once more.

From a linguistic and utilitarian point of view, we should decide which term has the most meaning and is easiest to understand. Cycles per second are the obvious, the only, units for frequency. It is certain that beginners will be more confused when they meet the term "Hertz" than when they meet "cycles." The name itself gives no indication of what it is defining, and beginners may even look in vain for a conversion factor between cycles and Hertz.

Electronics already has a reputation for being full of jargon. It is folly to make it worse, it is also bad economics.

One of the objections to "cycles per second" is that its abbreviations are in a chaotic state. This is quite true. However, the objection can be easily and fairly unobtrusively removed by agreeing on a set of standard abbreviations.

The system: Cs, KC, MC, etc., appears to be a logical one. Note that a capital "C" is used for the basic unit, thus removing one of the objections to "cycles." "Cs" is slightly inconsistent, but something was necessary to distinguish between "cycles per second" and the general symbol for capacitance, "C". Since economy of space is important, we might as well set the abbreviation close to the figures, thus—455KC.

I sometimes wonder if the term was not originally introduced by the Germans because it has such a lovely German ring to it. France possibly adopted it because it did not sound English, and the rest of Europe (except U.K.) followed suit for the sake of peace and quiet.

The general public, on the whole, probably understands the meaning of the term "cycles," but I doubt whether 10 per cent knows what "Hertz" means in the electronic sense. Furthermore, the similarity between "Hertz" and "hurts" is particularly unfortunate, because it could give rise to dangerous misconceptions about the relative potential dangers of the various types of electric power, DC possibly being imagined harmless because it has "OHz".

I may be accused of standing in the way of progress. Not so. The opposition is to useless change, which should be distinguished from progress. In your June edition you mentioned having a count of heads, to see who wanted to change to Hertz. I do not know who you counted, but you can count me in the old guard (for once).

Yours Faithfully, A.G.
(University of N.S.W.)

I imagine that A.G. probably speaks for a lot of readers who have grown up with cycles and kilocycles and who will perhaps never quite get them out of their vocabulary. I can say this with some feeling because it is quite a job to keep them out of our columns, in the interests of consistency; and I know that other publications are facing the same problem.

But I doubt that opposition to the change can be more than a token, because it is virtually a fait accompli.

In continental Europe, it's been Hertz all the way for years. More recently, American industry has fallen into line and I note that CCIR has now reached agreement on use of the term. In view of the spirited controversy over colour television, one must assume that the case for Hertz must have been fairly strong for them to reach agreement.

Either that, or the delegates had no fight left!

I note, by the way, that CCIR have also decided that the term ERP is ambiguous and have adopted a new term EIRP, meaning "Effective Isotropically Radiated Power."

Now for the subject of reliability:

Reliability Ignored

Dear Sir,

Being a designer of electronic equipment used in a variety of field conditions, I have noted with interest recent letters and your editorial regarding reliability—an aspect of design which is sorely neglected in this country.

If local industry is to hold its own against overseas competition in the sphere of professional and industrial electronics it must surely pay more at-

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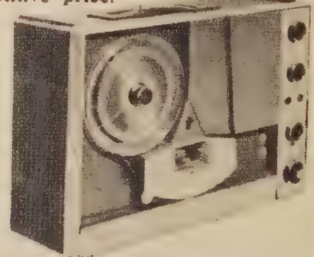

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tention to reliability, not only of
design but also of components an
struction.

How many Australian-made co
ents meet MIL, DEF, or DEF (
specifications? To my knowledge
are very few—and the industry do
appear concerned. A glance th
the pages of your journal reveal
minimal emphasis placed on spe
tions in advertising.

Overseas publications provide a
ing contrast in this respect. Why?
the increasing use of electronics b
Armed Services, government de
ments and various research organis
there must be a market for quality
ponents.

It is certainly impossible to desig
liable equipment using only locally
duced components, so we must as

Price rise for "ELECTRONICS Australia

As from next issue, the price
"ELECTRONICS Australia" will
to 30c per copy on Australian ne
stands and to 3/ in New Zealand.

There will be a corresponding
crease in subscription rates, as set
on page 160. These will apply to n
subscriptions and renewals, beginni
with November 1966 issue.

Current subscriptions will run
their stated expiry date witho
alteration.

We regret the necessity for the
crease but it has become impossi
to absorb continually rising costs
a price which has remained unalter
for nearly ten years.

In addition, there has been a su
stantial increase in the size of t
journal such that the last 12 issues ha
averaged 158 pages, compared wi
132 pages for the preceding 12 months

We are determined, not only
maintain "ELECTRONICS Australia
in its pre-eminent position in t
Australian electronics industry but als
to expand the interest content for a
reader groups.

that large sums of money are flowing
the pockets of overseas manufacture
a state of affairs hardly beneficial to
own interests.

Again, most Australian-made
equipment is suitable for use only
temperate climatic conditions, yet 99
cent of this continent is electro-cl
tologically classified as either arid tr
al, semi-humid tropical or humid tr
cal. Equipment which would give
isfactory field service in tempe
regions may not remain serviceable
more than a couple of months in th
harsher environments.

Although much is now known ab
materials, and techniques for preven
their deterioration under these conditi
it is not often that one sees this kn
ledge incorporated in locally made eq
ment.

Indeed it is difficult to find elec
plating firms, for example, which
familiar with Australian defence sp
fications for plating or anodising. M
firms seem reluctant to introduce
necessary quality control and an atti
of "near enough is good enough" is
valent.

Another neglected aspect of reliab

's ruggedisation. Equipment which must often be transported or permanently installed in trucks, aircraft or boats must be able to withstand the attendant vibration and shock. Very little locally made equipment is suitable and, again, one must buy from overseas.

The development of the more remote parts of Australia, coupled with the increasing use of electronics in all branches of science and technology, must create a growing demand for reliable instrumentation—a demand which the local industry, geared mainly to entertainment and communications, cannot hope to satisfy at this time.

Unless manufacturers take immediate and vigorous steps to meet this challenge, the outlook for Australian electronics can only be described as bleak.

Yours faithfully, K.S.
(Lyons, A.C.T.)

COMMENT: Component engineers may find this letter highly provocative. Is the position as grim as this correspondent represents it? If so, why?

If he is mistaken and Australian-made components are, in fact, available to meet modern rigid specifications, what is the basis of his error? Lack of observation on his part or a failure on the part of manufacturers to "communicate" the information effectively to someone who classifies himself as an equipment designer?

This letter invites further discussion.

N.Z. "PIRATES"

Please do not think (after publishing the comments of a New Zealander favouring a pirate radio station) that all New Zealanders have no regard for others, or international agreements. Nor that our broadcasting network is some government agency. May we set right any false impressions your correspondent may have given?

Broadcasting in New Zealand passed from a private company to a corporation in the early days. Then, in 1935, it was made a government department and almost all the private stations were taken over. A second separate department for commercial broadcasting was established later but both were amalgamated during the war.

In 1962 broadcasting was freed from State control and became an independent corporation. Only one private station remains, although legislation was passed to permit private stations to be licensed.

Now we have 45 broadcast stations, for a country twice the size of England, but with less population than Sydney.

The four main cities have a public service station, for public services, news, sport and music from classical to pop and jazz. (The .1MW station in Wellington also continues 24 hrs. daily.) Additionally, there are 18 hours daily of commercial radio, 13 hours daily of light music and variety with occasional commercials, and a fourth station with a B.B.C. type Third program, evenings only.

Some of the smaller cities have two stations, and nearly all centres of any size and importance have their own stations.

Could a miscellany of private stations have established such a network with such high technical standards? Not if Australia and the U.S.A. are examples!

One central organisation has been able to preserve standards of decency in commercials and resist advertiser pressure. And we get a rest from commercials on Sundays (pity our Aussie cousins)!

The debate as to whether broadcasting should cater to low tastes by giving people what they want, and (without taking it to "Big Brother knows best" extremes) whether they should be given some uplift as well will always be with us, but no one in electronics can completely shelve their responsibility to see that the medium is not wasted or abused.

At least we have something to show here, for having an organisation strong enough to windstand pressure — political, advertising or commercial.

No responsible person in New Zealand approves this pirate radio venture, especially when the lack of band space and the band-sharing agreements with Australia are known. So please don't think that the letter you published is typical.

There is a legal channel, for going about setting up a private station — if you can make out a case. So far, no one has! (Or one which has clearly demonstrated any real need.)

Personally, I have read your magazine for many years, and enjoyed it, and wish you well with the standard you keep.

One further matter. Page 33, June issue — our 1966 conference. Thanks for the publicity — but please do not think that we have only got around to having such things. The Electronics Institute held national symposia in the Capital City in 1964 and last year — this year Auckland had the honour. It was the first national conference in Auckland, and the first where we collaborated with the I.E. and R.E. — but not the first national conference.

But we do appreciate seeing mention of New Zealand activities in "Electronics." Surely your circulation here is large enough to justify more attention to this country?

Yours faithfully,
V. M. Stagpoole.
(Councillor, The New Zealand
Electronics Institute,
Sec. Wellington Branch.)

Firstly, I must thank Mr Stagpoole for his comments and for his explanation of the broadcasting set-up in New Zealand. He would appear to be well satisfied with the radio programs available in that country and, if he represents a majority view, the "pirate" broadcasters may be in for a lean time in N.Z. waters. The situation would appear to differ markedly from that in Britain, with the allegedly widespread dissatisfaction with B.B.C. radio and the large concentrations of population.

As for our coverage of New Zealand, we'd like to toss the ball back into that court. Our pages are as open to New Zealand writers as they are to anybody else and, where appropriate, we are quite happy to pay contribution fees. What about a story or two from within the N.Z. electronics industry, or one of the research groups, or from individual enthusiasts?

While the British Government is currently framing legislation aimed at crippling the pirates, it is being seriously suggested that the Government is being squeezed towards ultimate acceptance of large-scale commercial radio, to meet a demand which it cannot meet through the B.B.C. and the attendant licence fees. The possibility has been mentioned that certain pirate interests might ultimately be made legal and respectable and allowed to operate from British soil! ◘

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SD285	1,000	5
SD288.2	2,000	8.2
SD2812.5	3,000	12.5
SD2816.6	4,000	16.6
SD2820.1	5,000	20.1
SD2825.06	6,000	25.06
SD2829.19	7,000	29.19
SD2833.36	8,000	33.36
SD2841.70	10,000	41.7

MINIATURE TYPE: PH—panel type; SD—stand type

MODEL	WATTS	AMPS.
PH280.5	50	0.25
PH281	100	0.5
PH281.5	150	0.72
SD280.5	50	0.25
SD281	100	0.5
SD281.5	150	0.72

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The Serviceman

ON TACT, DIPLOMACY AND DISCRETION

How do you deal with the situation where you discover that a previous serviceman has done a patently incompetent job? Do you immediately condemn the job to the customer? Do you try to "break it gently"? Or do you try to conceal it? Much depends on circumstances, as one of this month's stories shows.

Superficially, this story was just an- er routine complaint concerning a l case of horizontal pulling. In fact, re was a good deal more to it than s, including an exercise in diplomacy her than mere technical skill.

To follow the story properly, it is essary to go back to my first en- nter with the set. This was several nths previous, when I had been call- on to rectify a minor complaint. Prior that it had been serviced by someone another district; someone who, I hered from casual remarks, the cus- ner regarded quite highly. In fact, I her sensed that I was very much on l to see whether I would come up my predecessor's standard.

t was against this background that made my first two calls, both for nor complaints and, in themselves, ating little difficulty. However, at the t call I noticed that the picture seem- marginally lacking in width and, al- ugh not sufficient to attract the ner's attention, I felt I should investi- e.

In this particular set, such adjustment olves re-setting a 220pF trimmer in grid circuit of the 6DQ6 horizontal put valve. Assuming the valve is l good, there should be plenty of ad- tment available. However, I soon lised that it wasn't going to be that y in this case. The trimmer was eady unscrewed as far as was ctical, indicating that someone else l tried and failed.

A sick 6DQ6? It seemed the most sonable suggestion, and I was on the nt of suggesting that this part of the needed some adjustment when some- ng else caught my eye. The mains tage selector had been set down from normal 240V position to the 200V sition. A quick re-set to the 240V sition, while the owner was momen- ily out of the room, confirmed that this position the raster was hopelessly lerscanned.

Suddenly I had a feeling that this situ- on could be a tricky one. If some- e, presumably the previous service- n, had been so hard pressed that he l been forced to adopt such brute ce tactics it could only mean one of things; either the fault was so tricky t it might well tax my own resources, that the previous serviceman was so inept that he had failed to find a routine fault and had taken the easy way out.

And either way, it could be an embarrassing situation for me. If it was a difficult fault it could appear that I was trying to make a big job out of a minor complaint. On the other hand, if it was a bodgie job, then it might be difficult to explain without criticising the previous serviceman. Either would be a most undiplomatic move in the present circumstances.

And so, very much against my technical inclinations, I'm afraid I took the coward's way out; I quickly restored the mains setting to 200V and decided to leave things as I found them. The best I could hope for was that the picture width would deteriorate fairly rapidly, thus solving the problem for me.

In fact, nothing happened for a couple of months, until I made the second minor call. This time I made sure that I had a spare 6DQ6 on hand and took the opportunity to substitute it in the course of my "testing." It made not one whit of difference, and I knew that I would have to get the chassis on the bench before I could solve the mystery.

Which brings me to the call I mentioned at the beginning of the story, and which did not occur until several months later. I couldn't be sure that the pulling really had anything to do with the lack of width, although there seemed to be a reasonable chance that it was, but I had no difficulty convincing the owner that the set would have to go back to the shop.

And what a weird set-up I found when I finally pushed it on to my own bench and turned it over. I don't know who the previous "serviceman" had been, but I can only hope that he was an amateur and not a professional who was foisting his unorthodox techniques on the public.

The only good thing about it all was that the fault was so glaringly obvious. Naturally, I had gone straight to that part of the underchassis involving the horizontal oscillator and output stage. I was immediately aware that the components around the 6DQ6 cathode had been disturbed, in particular the capacitor from cathode to chassis.

This is normally a 0.27uF but it had obviously been replaced. And in its place—wait for it — was a pair of .022uF. in SERIES. Small wonder that the poor old 6DQ6 was battling to fill the screen. With only a fraction of the normal by-pass across the cathode resistor, the latter would develop considerable negative current feedback, markedly reducing its sensitivity to the drive from the oscillator stage.

In fact, it is probable that the normal value is on the small side, at least for some of the lower frequency components, in order to provide a degree of waveform correction. Anything less would be intolerable.

But this was only the beginning of the story or, more precisely, the situation as it apparently had been before the recent failure. Closer examination showed that the 100-ohm resistor was open circuit and that both 0.022uF capacitors had broken down. Also, by reason of their close proximity to the 100-ohm resistor, and the fact that they were plastic types, they were in pretty "tatty" condition.

While I can't be sure of the exact sequence of events which led up to this situation, it would seem reasonable to suppose that the 100 ohm failed more or less normally, i.e., as a result of an inherent weakness. The capacitors, on the other hand, probably failed by reason of the quite high peak voltages which would then appear across them. The weakest one would fail first, allowing the full voltage then to appear across the second one, which soon followed suit.

Needless to say, a new 0.27uF and 100 ohm resistor brought everything back to normal. Not only did it cure the pulling, but it restored normal horizontal scan and allowed me to put the line voltage switch back on the 240V tap.

The only thing that remained to be explained was why these faults caused the erratic behaviour of the line oscillator, such as to create the marked pulling symptoms.

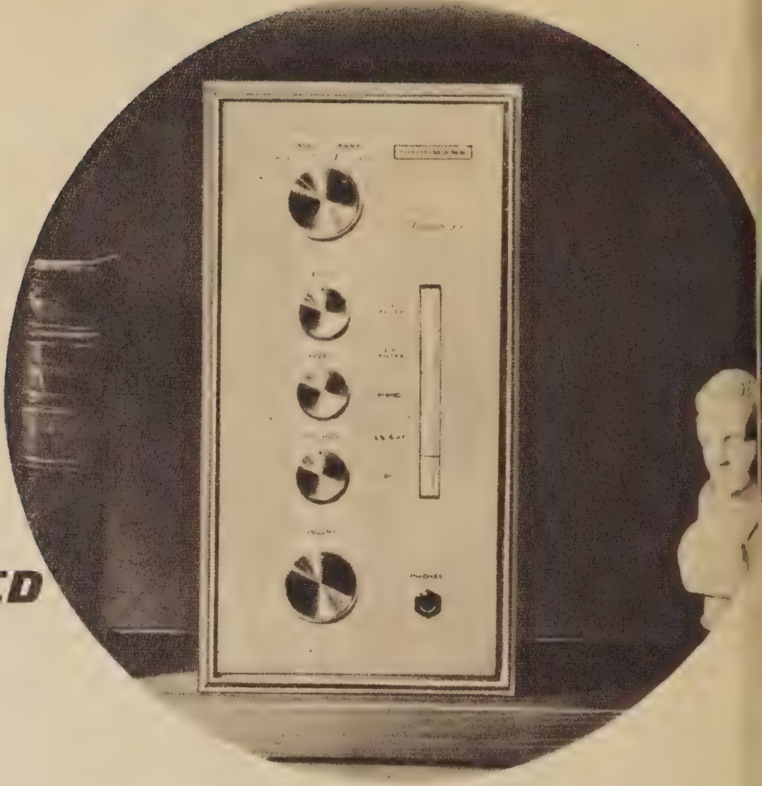
There would appear to be several reasons for this, which could have been present either singly or collectively. One factor could be the grid current drawn by the 6DQ6, which would increase with the virtual shorting of the cathode to chassis. This would load the horizontal oscillator and could even shift its frequency to the limit of the normal panel control.

Even more likely is the effect of the 0.27 cathode bypass. This can be quite critical in many circuits, including this one, because it provides a return path for part of the horizontal oscillator circuit. This is a blocking oscillator, using one-half of a twin triode, and the actual sawtooth generating network is a resistor and capacitor in series between the HT line and chassis.

In the process of charging, through the resistor, the capacitor develops a steadily rising voltage across itself, which is the sloping portion of the sawtooth. The near vertical stroke of the sawtooth results from the sudden discharge of the capacitor, due to a suitable discharge component or circuit connected to the junction of the resistor and capacitor. The discharge device can be, in its simplest form, a neon lamp or, as a next step, a gas triode. In practical TV circuits it is the blocking oscillator.

However, the exact means of discharge is not really important. What is important is the fact that the timing capacitor—a .0012uF in this set—does not connect direct to chassis in practi-

FULLY TRANSISTORISED



GOODMANS MAXAMP30

HIGH FIDELITY AMPLIFIE

☐ NO BIGGER THAN THE DIMINUTIVE MAXIM MINI-LOUDSPEAKER SYSTE

MAXAMP 30 is a fully transistorised stereophonic High Fidelity Amplifier using Silicon Transistors throughout. It is precision engineered and fullest use is made of printed circuits. It will deliver continuously up to 15 watts of power on each channel and it looks as good as it is. Its polished wood cabinet with 'Danish Silver' scratchgrain control panel blends with any decor.

PERFORMANCE SPECIFICATION

Power Output

30 watts r.m.s. maximum (15 watts per channel) into an 8 ohm load.
20 watts r.m.s maximum (10 watts per channel) into a 4 or 15 ohm load.

Total Harmonic Distortion

Less than 0·4% for 15 watts per channel into an 8 ohm load at 1,000 c/s.

Frequency Response

20 c/s to 20 Kc/s ± ½db.

Inputs

Pick up: monophonic or stereophonic; RIAA characteristic.
Sensitivity (a) 3·5mV, input impedance 47k ohms
(b) 50 mV, input impedance 100k ohms

Radio Tuner: monophonic or stereophonic; flat characteristic.
Sensitivity 100mV, input impedance 100k ohms.

Tape: monophonic or stereophonic; flat characteristic.
Sensitivity 150mV, input impedance 100k ohms.

Auxiliary: monophonic or stereophonic; for low output microphon tape heads, etc., flat characteristic.
Sensitivity 3mV, input impedance 50k ohms.

Outputs

Loudspeakers: 4-8-15 ohms.
Tape: High level signal for tape recording.

Hum and Noise

With reference to 15 Watts, volume control at maximum, all inpu −55db overall. Main section of amplifier only −80db with inp shorted.

Crosstalk

With input selector in any position, with unused channel inp open circuit, better than −40db with reference to 10 watts into ohms on the active channel.

Supply

Adjustable for 105-120-200-220-240 volts A.C. 40-60 c/s.

Made in England by Goodmans Industries Ltd.

For full particulars, write to the Australian Agents at address below.

Sole Australian Agents: **BRITISH MERCHANDISING PTY., LTD** · 60 Clarence St.· Sydney · N.S.W. Telephone: 29 1571 (3 line cal configurations. As a refinement, aimed at producing the required waveshape, it is returned to the cathode of the 6DQ6, completing its path to chassis via the 100 ohm resistor and the 0.27 uF capacitor.

This makes these two latter components part of the timing circuit as well as a bias network for the 6DQ6, so that any change in value can upset the behaviour of the oscillator circuit. In fact, it is easily demonstrated that the 0.27uF can have quite a marked effect in this direction, and has often had to be replaced when oscillator behaviour was erratic.

After all this, I'm afraid the set's homecoming was something of an anticlimax. As far as the owner was concerned, I had simply cured the pulling problem and that was that. There was no diplomatic way to tell him what I had found, and I doubt if he will ever be aware of the improved scanning. My only consolation is that I know that the set is now behaving a lot better than it was before.

My next story concerns another, apparently, routine fault which turned out to be rather more than I bargained for. It started out as a complaint that the set would produce neither sound nor picture—and it is hard to imagine a more routine fault than that. It generally turns out to be something quite obvious, like a valve or a fuse, which one can diagnose and correct in a matter of minutes.

Fortunately, as it turned out, the owner had to go out for the day and, being a trusting soul, left the key with a neighbour so that I could let myself in. This at least saved me from what might otherwise have been an embarrassing situation.

I switched the set on and waited for it to warm up. After a reasonable time, with no sign of sound or picture, I looked in the back of the cabinet. I was greeted by the sight of the 5AS4 starting to glow a dull red, and getting brighter every minute. I switched off hurriedly.

Examination of the HT fuse confirmed what I suspected; someone had replaced the correct fuse with one of the automotive variety with many times the rating. Well, it was still fairly routine, since this is not unusual when a HT short blows a fuse. The fact that it was a HT short was established by measuring from the appropriate fuse contact to chassis.

The next step was still routine. While one can try guessing where a HT short may be, and sometimes hit the jackpot, there is really no substitute for the process of elimination: disconnecting various branches of the HT line until the faulty section is isolated. Of course, it means pulling the chassis, but this will probably be necessary, anyway, to correct the fault.

With the chassis withdrawn and upended I commenced lifting various HT branches, and soon established that the fault was in the tuner. So far, so good. Now what would be a likely culprit? The valves are always a good bet, if only because they are an easy check by pulling out.

The 6BQ7, which I tried first, had no effect, but removing the 6U8 immediately cleared the fault. So I had a 6U8 with an internal short. Still perfectly routine.

I fitted a new 6U8, restored the disconnected HT lines, checked the complete HT system for freedom from shorts—an important step in the light of subsequent events—and switched on hopefully. And quite suddenly the job stopped being "routine." The 6U8 lit up like a ball of fire and almost at the same moment I became aware that the 5AS4 was getting red in the face again. I hit the power switch as fast as I could but, as it ultimately turned out, I wasn't fast enough to save the 6U8.

However, right then I was not exactly sure what had gone wrong. Had I simply replaced one faulty 6U8 with another with a similar fault? It was long odds, but new valves have been known to fail in such circumstances. Or was it some more subtle fault, which would necessitate pulling the tuner to pieces?

As it happened, I had the means to hand to clarify this in a quick, though somewhat drastic manner. Only that morning I had replaced a 6U8 in another set, and the discarded valve was in my kit. Since it had come to the end of its useful life in its accepted role, it might just as well go out in a blaze of glory—if fate so willed it—as finish up as so much crushed glass in the rubbish bin.

STAFF VACANCY

A new, permanent position is available on the technical staff of "ELECTRONICS Australia" for a man with the background to develop, build and test electronic equipment of the type described regularly in our pages. Potential as a technical writer is essential. The position carries good working conditions, generous leave and superannuation, with a salary, by negotiation, to B-grade journalist level ($79.50 p.w.). Apply by letter, quoting references and background to:

The Editor,
"ELECTRONICS Australia"
Box 2728, G.P.O.,
Sydney, N.S.W.

I plugged it in, switched on, and kept one hand on the switch. In 30 seconds it was all over; the same ball of fire inside the 6U8, the same faint flush in the 5AS4 by the time I switched off. Well, anyway, I now knew that the trouble was more deep-seated than the 6U8's, but I was glad the customer had not been there to see the wholesale destruction of these valves, particularly the first one.

By now it was apparent that the job was beyond the scope of the customer's loungeroom. At the very least I would have to open the tuner—an incremental type by the way—and it was quite likely that it would have to go back to the makers. Tuners in general, and incremental types in particular, are usually handled more economically by specialists, particularly if replacement parts are required.

Nevertheless, I decided to make one more test before I packed things up, more for my own satisfaction than anything else. Removing the 6U8 from its socket, and using a fine-pointed probe I keep handy for such jobs, I checked the voltage at each socket pin. Naturally, they were rather wide of the mark with no load applied, but they gave some useful indication after allowing for this.

Everything seemed reasonably normal until I reached pin 2, the pentode grid. Here I encountered the full HT voltage for the tuner; something like 260 volts, and enough to distress any valve. More than ever, it seemed reasonable to take everything back to the shop.

Back on my own bench I slipped the cover off the tuner, reasoning that this much at least was justified before packing it off to the makers. Immediately, I spied a badly overloaded resistor which turned out to be a 1K connected directly to the tuner HT supply. Nearby was a small capacitor, also showing signs of distress, which turned out to be a 180pF.

A more precise check showed that the capacitor was a dead short. The resistor was still intact electrically, but obviously needed to be replaced also. When the two new components had been fitted, I checked the grid pin voltage before I dared risk another 6U8. When I found nothing more than a slight negative deflection, I felt a good deal happier.

In fact, everything worked perfectly, and I was able to return the set to the owner later the same day; something which, in itself, justified tackling the tuner myself.

As I intimated earlier, tuners — and particularly incremental tuners — are not easy things to follow, either in the flesh or on paper. However, now that the fault had virtually presented itself to me, it was relatively easy to refer to the circuit, identify the offending capacitor, and trace the circuit towards the 6U8 grid. Sure enough, after negotiating a couple of switch and coil networks, I was able to establish a path from the HT supply, through the 1K and the broken down 180pF, to pin 2 of the valve.

But this raised another point. What had caused the HT line short which I had originally observed? It certainly wasn't the 180pF because this could not have provided a path to chassis, only to the 6U8 grid. And, in any case, the short vanished when I removed the original 6U8, so that it must have been within this valve and undoubtedly a result of the violent overheating of the elements.

Whether the second or third valves ever reached this stage I have no way of knowing but, even if they did not, the current drawn by a grid with 260 volts positive on it would be fairly considerable, as testified by the rapid and drastic overheating. On the other hand, it would not be unreasonable to assume that the grid, being in such close proximity to the cathode, could be attracted to it under stress of such a high voltage, thus creating a short immediately the HT was applied. ■

For our younger readers:

REACTION
BANDSWITCH
VOLUME
TUNING

A 3-BAND RECEIVE
WITH SWITCHED COIL

Encouraged by the reception afforded the "ABC" series of receivers, we re-present in this article an excellent little 2-valve 3-band receiver originally featured in the May 1957 issue. It is an ideal project for those hobbyists who like to use parts salvaged from unwanted receivers, or still usable components discarded by manufacturers, servicemen or amateur operators.

A front view of the receiver, as originally presented. Appearance would probably be improved by discarding the escutcheon in favour of a plain cut-out. Alternatively, a completely different type of dial may have to be substituted, as outlined in the text.

Our mail reflects a constant demand for small receivers covering the broadcast and short-wave bands. The "Three-Band-Two" is still well able to take its place among small receivers and to give a very good account of itself, despite its modest design.

Not surprisingly, the situation has changed, since the initial description, in regard to certain components and the article herewith has been suitably amended.

As may be seen from the circuit diagram, this set uses only two valves, one of which is an RF pentode and a triode in the one envelope, such as the 6U8 or 6BL8. The other valve is a 6X4 rectifier. or, with suitable change of socket, a 6V4.

Operation is from the power mains and the little set delivers sufficient power to operate a speaker on the local stations; headphones can be used for weaker signals from distant broadcast and overseas stations.

Like most other such small receivers, the "Three-Band-Two" relies heavily for its performance on the use of regeneration or "reaction." Properly used, however, and assuming a reasonable aerial and careful tuning, a great many signals are to be heard at useable strength.

For the novice, a brief word of explanation may be in order about regeneration (or reaction).

In this receiver, the incoming RF signal is fed from the aerial, via a tuned circuit, to the grid of the pentode. Though this valve section is intended to function primarily as a detector, an amplified version of the RF input signal does appear at the plate. The idea of regeneration is to transfer some of this amplified RF signal back to the grid circuit to reinforce the input signal.

The signal fed back tends to make up for natural losses in the tuned circuit and with the system adjusted to give just the right amount of feedback, there is a remarkable increase in both sensitivity and selectivity.

If the amount of energy is too great, the valve will oscillate and. in so doing, generate an RF signal of its own. This self-generated signal beats with, or "heterodynes" incoming signals, so that an audible whistle is heard, changing in pitch as the receiver is tuned across each station carrier.

The whistle serves a purpose when it is desired to listen to code transmissions from stations using an otherwise unmodulated carrier. By having the receiver detector oscillating weakly, the code transmission can be heard.

With normally modulated carriers, however, the whistle interfers with intelligibility and may also cause interference in neighbouring receivers tuned to the same station. To operate the receiver to best advantage, the reaction control should be advanced to just below the point of oscillation.

A distinctive feature of the "Three Band Two" is the use of switched, rather than the usual plug-in coils. Pl
in coils have the advantage that t
can be withdrawn easily for modificat
and experiment and they probably p
sent fewer wiring difficulties. In ope
tion they are less convenient, howe
and this is one receiver where we ch
the alternative approach.

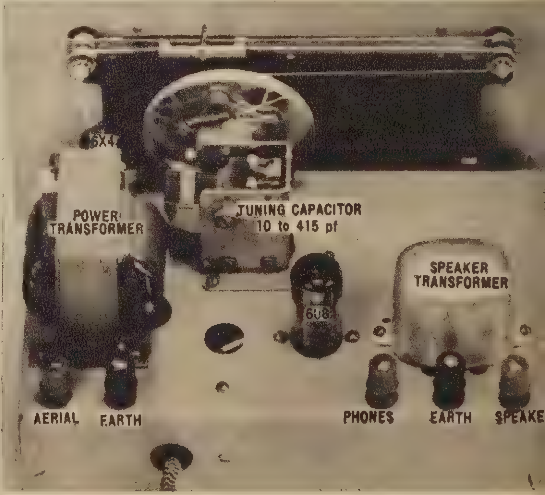
Interstage shielding is not of
special importance in a simple regene
tive receiver of this type. It is necessa
however, to make sure that the co
ponents of the tuned circuit are me
anically firm and that the dial me
anism is smooth and capable of retu
ing to a given setting with accuracy.

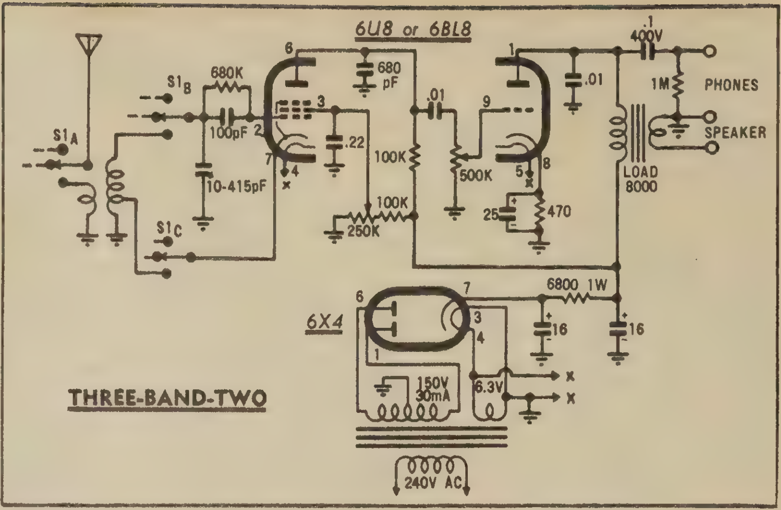
Nevertheless, the tuned circuit sho
be shielded in some way from the ope
tor so that a carefully set adjustment
not disturbed when his hands are
moved from the controls. A metal fr
panel is helpful or possibly the me
plate of a dial. A metal chassis is a
a good thing.

Otherwise it is a matter of mounti
all chassis components firmly in the m
convenient place and at the same ti
making sure that all solder joints
good both electrically and mechanical

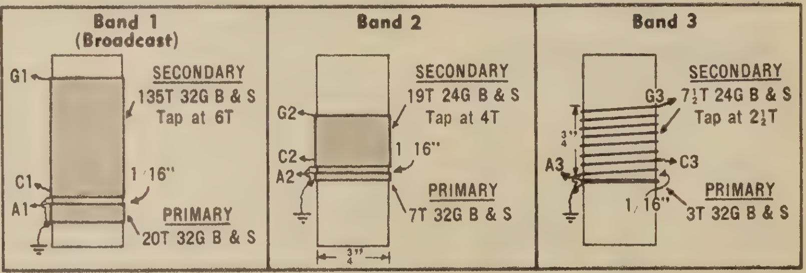
The 6U8 valve is one that was orig
ally designed for use in television tune

The receiver from the rear, with a vacant hole for the possible addition of an extra valve. One section of a discarded 2-gang capacitor could be used for tuning, but extra space may need to be provided on the chassis.





The circuit of the "Three-Band-Two" amended slightly to use current component values. The output transformer should suit the voice coil impedance of the loudspeaker, with a primary impedance of somewhere between 5000 and 10,000 ohms. The coil winding data is set out below.



combines, in the one envelope, an pentode and a triode, both with ex- lent performance characteristics.

Nowadays, an obvious alternative to ggest would be the 6BL8, a very simi- valve with the same base connections. fact, a number of other combination pentode/triode valves might be essed into service though, in some ses, the pin connections may be dif- ent.

When originally designing the re- ver, and as mentioned earlier, we cted to use the pentode section as detector—actually in the old and miliar "leaky grid" circuit. The triode nctions as an audio amplifier, feeding e loudspeaker or phones.

The role of the pentode may actually divided up as follows:

(1) The grid and cathode act rather e a diode detector to rectify (or "de- ct" or "demodulate") the incoming RF gnal, transforming it into an audio gnal.

(2) The pentode as a unit amplifies e audio signal appearing at its grid d develops a much larger audio volt- e across its plate load, which is liberately made a quite high value of sistance.

(3) It also amplifies the RF signal com- nent to operate the regeneration or re- tion circuit, as mentioned earlier.

Feedback for the regenerative circuit obtained by placing a tap in the tuning il and returning the cathode to this oint.

Practical advantages of the circuit are at a single tapped coil rather than a ned winding plus reaction winding is quired. Further, the regeneration can onveniently be controlled by varying e voltage on the screen of the valve ith a potentiometer.

The position of the tap on the coil quite important, because it governs e screen voltage at which the valve ill go into oscillation.

In general, best sensitivity is obtained hen the tapping is kept well down to- ards the earthed end of the coil, re- uiring the screen voltage to be set well p towards the positive end of the otentiometer, to secure sufficient re- eneration. At the same time, however, ufficient latitude must be provided so at adequate regeneration is always vailable, over the whole tuning range f the particular coil, and when con- ected to any likely length of aerial.

The audio signal from the detector fed via a coupling capacitor to a olume control potentiometer. Proper se of this control is important to the nd result.

There will be cases when the output olume will be too great. Backing off e regeneration control to correct this ould spoil the selectivity and allow nterference from strong adjacent tations. With the volume control in ircuit, the optimum position of the eaction control can always be used.

The triode stage provides a worth- hile amount of audio frequency ampli- cation and at the same time matches fficiently to the load presented by a oudspeaker or a pair of headphones. he power output is sufficient to operate loudspeaker at a worthwhile volume, bout the same that is available from n ordinary portable receiver.

Given a sensitive speaker, you will robably find that there is much more olume available than you actually need hile, even with one of the older and less sensitive speakers, you will probably get by.

Power output is not the same thing as amplification and, although when tuning to the locals there will be sufficient amplification to make full use of the power output of the output stage, you will find that, with distant and overseas stations, the tendency will be to turn the volume control full on.

Greater effective amplification can be obtained by using a pair of headphones. If you have low impedance phones (thousands were sold through disposals dealers after the war) they can be connected to the speaker voice coil winding of the transformer.

If the phones are of the high impedance type, best results will be obtained by connecting them from the plate of the output valve to chassis through a capacitor. A special terminal is provided for this purpose.

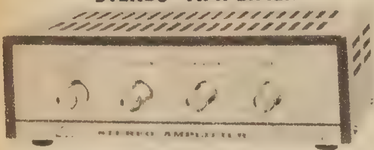
A resistor is shown connected across the high impedance headphone terminals and at first glance it may not appear to be necessary. Its purpose is actually to prevent the coupling capacitor discharging and hence the output terminal coming up to the potential of the plate of the valve. When this happens, it is possible to get a slight shock by touching the output terminal. The presence of the resistor ensures that the capacitor remains charged and the DC potential of the output terminal at chassis level.

A small fixed capacitor is connected directly from the plate of the output

PARTS LIST

Front panel, 9in x 5 5/8in. (See text.)
Chassis, 8 x 5 x 1 7/8in. (See text.)
Dial (see text, illustrations).
Switch, 3 x 3 single bank.
Tuning capacitor: Roblan, single section, 10 to 415pF.
Power transformer: 150-0-150V, 30mA, 6.3V.
Output transformer: To suit speaker; pri. imped. 5000 to 10,000 ohms.
Valves: 6U8 (or 6BL8) and 6X4.
Capacitors: 1 25uF 40V; 2 16uF 350V; 1 0.22uF 300V; 1 0.1uF 300V; 2 .01uF 300V; 1 680pF ceramic or mica; 1 100pF mica.
Resistors: 1 1M ½W; 1 680K ½W; 1 500K potentiometer; 1 250K potentiometer; 2 100K ½W; 1 6.8K 1W; 1 470 ohm ½W.
Sundries: 4 knobs, 5 terminals, 2 tag strips, 1 9-pin miniature socket, 1 7-pin miniature socket, length of ¾in diam. paper tubing, scrap sheet metal, length 32 gauge B and S enam. wire, length 24 gauge B and S enam. wire, hook-up wire, solder lugs; power flex, power plug, nuts and bolts, etc.

PALACE 8-WATT STEREO AMPLIFIER

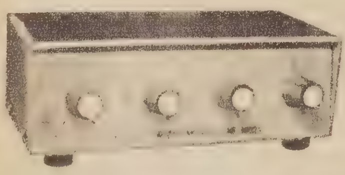


SPECIFICATIONS:

● Output Power: 8 Watts, 4 Watts per channel. ● Frequency Response: 60 to 15,000 cps ± 1db. ● Harmonic Distortion: Less than 3 per cent. ● Hum and Noise: 52 db below rated output. ● Sensitivity: Phono (Crystal) 100mV 250K ohm Tuner 100mV. ● Tube Complements: 12AX7 x 1, 30A5 x 2, 1S315 x 1 (Silicon Rectifier). ● Dimensions: 9¾in x 6¼in x 3in. ● Weight: 5.1lb.

Price $32.50

MODEL M6 FOUR CHANNEL TRANSISTORISED MICROPHONE MIXER



All four inputs accept standard two circuit Phone Plugs, while the output jack accepts a standard circuit Phone Pin Plug.

SPECIFICATIONS:

● Input Impedance: "Hi" Impedance for Crystal Microphone, etc. ● Gain: Approximately 6 db. ● Maximum Input Signal: 1.5 volts. ● Maximum Output Signal: 2.5 volts. ● Output for Minimum Distortion: 2 volts. ● Hum: 0. ● Battery: 9 volts.

Price $6.75

BELLPHONE

Adequate for the education of children. Pick up the receiver and dial push number desired.

Price $18.00 per pair

Please Note: Clarence St., city, and Liverpool Stores are open Saturday mornings.

KALTRO SVC REMOTE CONTROL TV-RADIO LISTENER

This TV-Radio Remote Control Listener is a combination of an extension speaker and a remote control station to regulate the sound of both the TV, Radio, Phono, or Hi-Fi set and the speaker incorporated in the Listener itself. In addition, up to two earphones can be attached for listening to the sound of the TV, Radio, Phono, or Hi-Fi set without disturbing others around you. Unwanted commercials can be easily cut off by merely turning down the control of the TV-Radio Remote control Listener. A modern designed plastic cabinet with easily adjustable fingertip controls ideal for use in home, office and business. Complete with earphone, 20ft of lead wire and installation instructions.

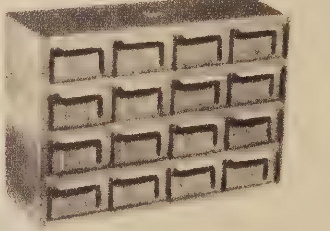
Price $8.75

CHEST OF DRAWERS

Three types of Galvanised Chests measuring 17⅛in x 6¾in x 11⅞in, containing 16 drawers, each measuring 6⅝ x 3¾in x 2⅛in.

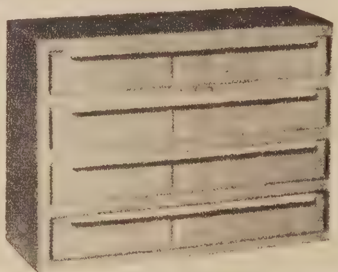
- TYPE C.D.1. With 16 undivided drawers, **$7.00.**
- TYPE C.D.2. With 16 triple compartment drawers, **$8.00.**
- TYPE C.D.3. With 8 triple compartment drawers, and 8 undivided drawers, **$8.00.**

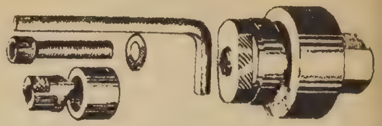
The Chests are finished in blue hammertone stoving enamel, are complete with identification cards and packed in strong corrugated cartons. Provision is made for all units to be bolted together in tiers.



CHEST OF DRAWERS TYPE C.D.4.

A 17⅛in x 6¾in x 11⅞in Galvanised Chest containing 4 full-length drawers each measuring 15¾in x 6⅝in x 2⅛in. Finished in blue hammertone stoving enamel. **$7.00.**





"PIPGRAS" HOLE PUNCHES

"PIPGRAS" Hole Punches are made from Alloy Tool Steel, and cut clean and accurate holes in sheet metal. They make a smooth, perfect hole without reaming or filing.

SCREW TYPE, ROUND

Supplied with "UNBRAKO" High Tensile Socket Screws and Wrenches. Cut holes in sheet metal up to 18 gauge.

Type No.	Nominal Size	Actual Size	Water Pipe Size (I.D.)	Pilot Drill Size	Price Each
32.S	½in	0.507in	—	¼in	$2.17
40.S	⅝in	0.618in	¼in	5/16in	$2.17
48.S	¾in	0.742in	⅜in	5/16in	$2.80
56.S	⅞in	0.884in	½in	⅜in	$3.80
64.S	1in	1.008in	—	⅜in	$4.10
72.S	1⅛in	1.133in	¾in	⅜in	$4.53
76.S	1/3/16in	1.172in	—	⅜in	$4.53
80.S	1¼in	1.258in	—	⅜in	$4.97
88.S	1⅜in	1.382in	1in	7/16in	$5.97

With Heat Treated, High Tensile Steel Hex. Head Bolt and Nut.

Cut holes in sheet metal up to 16 gauge.

Type No.	Nominal Size	Actual Size	Water Pipe Size (I.D.)	Pilot Drill Size	Price Each
96.S	1½in	1.512in	—	9/16in	$6.68
112.S	1¾in	1.762in	1¼in	9/16in	$7.60
128.S	2in	2.014in	1½in	9/16in	$8.33

MANUALS

Radio Servicing No. 1	$1.00
Radio Servicing No. 2	$1.75
Radio Servicing No 3	$1.50
Fault Finding No. 4	$0.88
Television Servicing No. 1	$1.50
Television Servicing No. 2	$1.50
Television Servicing No. 3	$1.00
Television Servicing No. 4	$1.25
Philips valve data Book New Issue	$3.00.

25c postage.

THIS MONTHS SPECIALS

THIS MONTH AT CLEARANCE	PRICES
Brand New 8in Speakers, 15 OHM VC.	$3.00 ea.
Speaker Transformers C Type 5000 OHM/1	$1.50 ea.
Speaker Transformers D Type 5500 OHM/3.5	$1.25 ea.
Speaker Transformers K Type 9500 OHM/3.5	$1.25 ea.
Speaker Transformers C Type 1500 OHM/2 line	$1.50 ea.
Electros: 8 MFD/300V Upright	38c ea.
40 MFD/200V Pigtail	50c ea.
24 MFD/150V Pigtail	40c ea.
10 MFD/50V Pigtail	21c ea.
20 MFD/150V Pigtail	40c ea.
12 MFD/450V Pigtail	40c ea.
150 MFD/40V Pigtail	49c ea.
42 MFD/200V Pigtail	44c ea.
8 MFD/450V Upright	40c ea.
32 MFD/300V Upright	45c ea.
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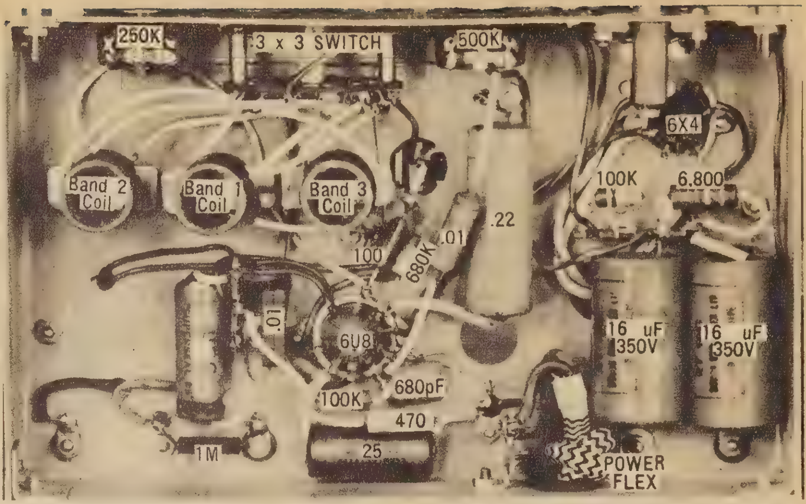


An underneath view of the original receiver. Note that the broadcast band coil is mounted between the two short-wave coils, minimizing possible interaction between them. If the layout is varied to use available but larger components, try to keep the leads short, particularly from valve and tuning capacitor to the switch and thence to the Band 3 coil, covering the highest range of frequencies.

ile section to chassis. It may not be tly necessary in all receivers, but we that it is well worth including since prevents amplified radio frequency als appearing at the plate of the e and possibly being fed back into detector. The most serious practical lt of stray feedback is that the neration is affected by the setting of volume control.

or the original laboratory model, a ssis measuring 8in x 5in x 1-7/8in used. The last dimension was the imum which would allow a switch coil formers to be fitted underneath. ore deciding on this dimension, it ld be wise to obtain the coil formers and then make sure that there is ugh depth in the chassis to accommo- them.

he other dimensions could easily be le much smaller if you have any ial reason for so doing, but most ders will want the set for use at ne when there doesn't seem to be ch point in trying to cramp the parts as small a space as possible.

pace has been left for an extra valve ch can be added later if you wish. re is plenty of current available from power transformer and the extra e will allow speaker reception in the s where headphones would other- e be required.

he dial now claims our attention. the original receiver, the dial used an Efco type USL/37. These are no ger made, but it is more than likely t there are some still available and y be unearthed by searching around. the other hand, there must be many these dials in junk boxes, or on old eivers which have been "retired."

or those who will be using this dial, will include suffiicent information m the original article, so that it may used to best advantage. To this end, are including the drum and dial cord out diagram and a full size copy of dial calibrations.

The dial needs to be modified to suit purpose, by removing the original ibrations from the dial glass and plac- a calibrated scale behind the pointer.

The full-sized reproduction of our ginal scale may be used as is, or ied on better quality paper. Provided use the same tuning capacitor and ke the coils exactly to specifications, calibrations should not be far out.

If the error is unacceptable, the re- ver can be made to tune to a slightly ver frequency by adding a turn or so the tuned winding of the coil or to ver a slightly higher frequency by re- ving a few turns. This applies to each the three bands.

The other adjustment you can under- e is to shift the position of the dial drum, which will have the effect of shifting the entire set of calibrations to one side or the other. Alternatively, you can achieve the same result by shifting the dial pointer in relation to the cord.

Inevitably, however, many readers will not have, or be able to obtain, one of the original dials and it will be necessary to turn to an alternative arrangement. A very satisfactory movement and dial scale assembly is marketed under the Jabel brand and is normally available through trade houses.

There are two versions, differing in the drive ratios, with a resultant difference in space required behind the movement. Both use the principle of planetary drive, which gives a very smooth action. The simpler one has a ratio of 6 to 1 and the other, both 6 to 1 and 36 to 1. The type numbers are JB6/1 and JB6/36.

If you happen to have a copy of the issue for May, 1966, then a good idea of this dial and movement may be had by referring to page 82. The one illustrated is the dual-ratio version. The only difference, as far as mounting is concerned, is the fact that the barrel of the single ratio movement is shorter and the variable capacitor will be mounted slightly further forward.

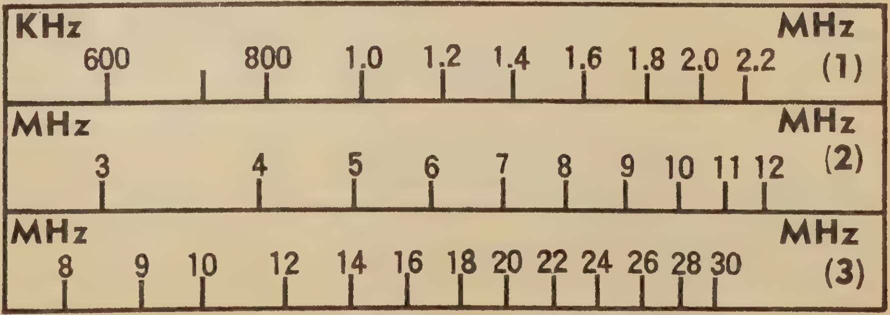
Compared with the other dial of the original receiver, this dial is mounted quite differently. The tuning knob will be located above the line of other knobs and, in addition, the dial scale, which measures 4½in x 3in, requires somewhat more vertical space. This means that the original panel height of 5 5/8in, would need to be increased by nearly 1in.

The dial movement and assembly are quite easy to mount on the front panel and the method would be virtually self-evident upon inspection. The important thing to watch, is that the drive bush must be at the exact height to match the variable capacitor used.

The dial, as supplied, has a numerical scale, calibrated 0-100. Three other blank scales are provided and these may be used, one for each tuning range.

Where no facilities are available for calibrating these scales, we suggest that an approximation may be arrived at by making reference to the scale published with this article. As an example, on range (2), the low frequency end corresponds to just under 3MHz. The high frequency end extends up to 12Mhz, with the centre frequency very near to 6MHz. These points may be pencilled on the appropriate scale as an initial guide. As stations are logged whose frequencies are known, the calibrations may be verified or added and the scales built up in this way.

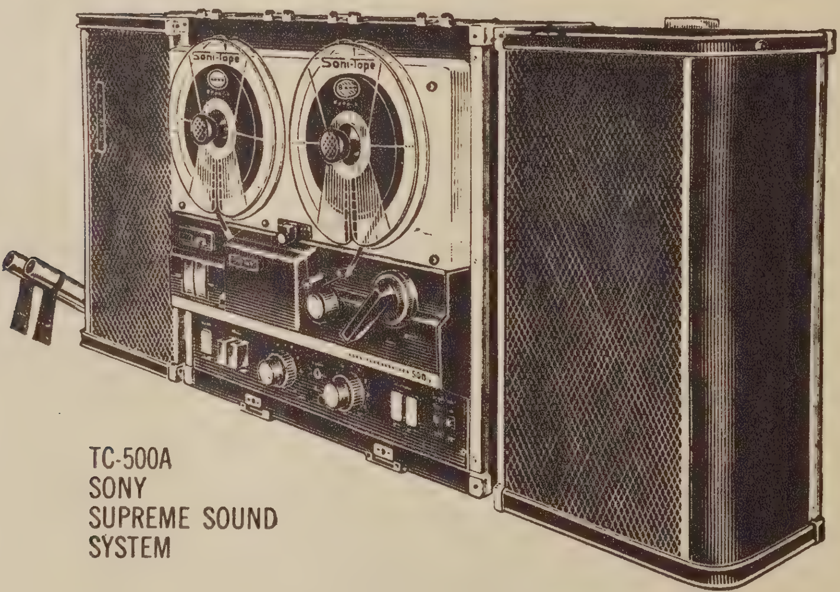
If you are fortunate enough to have, or to be able to borrow, a signal generator, the three ranges may be fully and accurately calibrated. This also applies, even if the other dial is used, and a check on the calibrations should prove well worth the trouble involved.



his dial scale will be alid only if the tuning apacitor is used, as speci- ied in the parts list, the oils are duplicated exact- y and a dial devised with he same pointer travel. Otherwise, it will serve as guide to the coverage of the receiver.

TC-260
4-TRACK
STEREOPHONIC

SONY . . . SETS HIGHER STANDARDS IN SOUND RECORDIN



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SUPREME SOUND
SYSTEM

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SONY TAPE RECORDERS RANGE FROM 29 GNS. TO £4

itart building by mounting com-
ents on top of the chassis. Power
isformer, speaker transformer, tuning
acitor, valve sockets and terminals
uld all be firmly fixed in place with
in diameter or 5 BA nuts and bolts.
ing is easiest if the nine-pin socket
the 6U8 or 6BL8 is mounted with
2 (the pentode grid) nearest the
it of the chassis.

ubber grommets should be placed
the holes for the power transformer
ls and power cord to prevent possible
rp metal edges cutting through the
ilation and causing a short circuit.
ce an insulated washer and a solder
under the nuts holding three of the
ninals. The two earth terminals con-
t direct to the chassis and the insu-
ng washer is not required. At the
e time a solder lug should be in-
led, since it is unwise to depend on
metal chassis for a good connection.

wo tag strips, one near each valve,
l some of the small components
ch are not otherwise conveniently
ported and help to keep the wiring
t and firm. A third tag strip near
hole for the power cord supports
connections between the power cord
the wires from the transformer.

Ve suggest wrapping some insulat-
tape around the mains connecting
, just in case a soldering iron,
wdriver or, worst of all, a finger
pens to get into the wrong place
le the power is on at some later
e.

f you are using a dial similar to the
inal one, it will have to be taken to
ces and reassembled to fit in with the
uirements of this set.

emove the dial drum, the control
dle and completely disconnect the
l. The control spindle is then mount-
on the right-hand side of the chassis
king from the front. Use a bolt with
ountersunk head in the inside hole
that the dial can fit flat against the
ssis.

s you will see when examining the
ts the distance between the chassis
front panel and hence the required
gth of the control spindles depends
the thickness of the moulded escut-
on. This was originally designed for
unting in the front of a wooden
inet and is therefore thicker than
ded for the metal front panel.

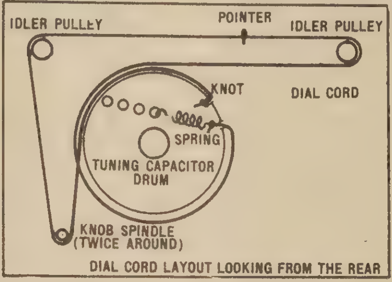
Ve thought it worth the trouble to
most of the flange away, leaving
enough to be flush with the rear side
the panel, which does away with the
nnel" appearance when the full escut-
on is used.

More recent thoughts on the matter
escutcheons is that they can often
done without, sometimes improving
appearance by doing so. A neat hole
ut out of the front panel and simply
this way.

The dial mechanism is held to the
ssis by means of two ⅛in diameter
ts but, at the same time, the two
tre controls assist the small bolts
en the retaining nuts are tightened.
f you are using the printed dial scale,
nove the original dial glass and
nent the scale to the metal plate.
hind the pointer but to occupy the
e position when seen from the front
the original scale.) The original cali-
tions on the dial glass should then be
aped off, say with a razor blade, and
glass cleaned and replaced.

The front panel can now be mounted
manently, using long ⅛in diameter bolts and pieces of brass tubing ¼in OD ⅜in long as spacers. If you decide to calibrate the scale yourself the panel mounting should be done later.

All wiring under the chassis, except that between the coils and the band-switch can now be completed. It is a good idea to run a length of tinned copper wire around all earth points just in case one of the points does not happen to make good contact with the chassis because of paint on the surface. Don't forget to earth the centre shield of the 9-pin socket.



The stringing of the original Efco USL-37 dial, viewed from the rear. Constructors may be able to contrive a similar dial from existing dial hardware and a drum of about 2¾in diameter.

The next logical step is to make connections where wires only are involved. For example, the wires between the power transformer and the rectifier valve, the wire from the centre of the volume control to pin 9 of the 6U8 socket, the wire from the centre lug of the reaction control potentiometer to pin 3 of the 6U8 or 6BL8, etc.

Wiring components can be installed next. The 16uF electrolytic capacitors are supported at the high tension end by the tag strip near the rectifier valve socket. The same strip supports the 6800 ohm filter resistor in the high tension lead, together with the 0.1 megohm resistor leading to the reaction pot.

The 0.01uF bypass and the 0.1uF coupling capacitor at the plate circuit of the 6U8 or 6BL8 triode section are conveniently supported by a tag strip near the valve socket.

The remainder of the wiring components are small enough to be supported directly between circuit points with their connecting wires. Where the wires are longer than about ½in it is a good idea to use nylex or cambric tubing to obviate any possibility of short circuits.

The important job of winding the coils has been left until last. For a start you will need some tubing about 1¾in diameter. Polystyrene and bakelised paper are excellent for the job.

Each former has to be 1¾in long and it is necessary for this dimension to be accurate, particularly for the broadcast band because there is only just sufficient room to wind the coil.

As mentioned earlier, if the formers happen to be longer, the chassis will have to be made deeper to suit, or the formers will have to be cut shorter.

The taps can be made either by twisting a loop into the wire or by terminating it at the appropriate point with the aid of a pair of holes side by side.

The formers have to be held in position under the chassis and no doubt many readers will find satisfactory methods for their own case. We made two diagonally opposite cuts in the tubing, each about ⅛in wide and 3/16in from the chassis end.

Then, a piece of scrap metal (either 16 or 18 gauge would be suitable) about 1in long and ⅜in wide with a hole through the centre is passed through the slots cut in the coil former. A ⅛in bolt passing down through the chassis and through the hole in the scrap metal will then hold the coil former firmly.

One end of all three coils connects directly to the chassis earth system. The other end and the tapping must be wired to the switch in such a way that, in the respective positions, they pass through to the valve grid and cathode.

Since it is normally possible to see which contacts are mating with which, the best procedure is usually to set the switch in a particular position and wire one particular coil so that the correct connections are made. Then put the switch in the second position and wire the second coil. Similarly for the third position and coil.

With the coils in place, you will be itching to switch on for the first time.

Plug in the 6U8 or 6BL8 only for a start and switch on the mains power. The cathode should light to a dull red colour and there should be no sign of heating elsewhere in the set. If all is in order, switch off, plug in the 6X4 rectifier valve and switch on again. The cathode should light to a dull red colour but again there should be no sign of sparking inside the valve nor should the plates show any sign of colour.

While making this test it is a good idea to have one hand on the power switch so that you can remove the power at the first sign of distress.

If all is in order you should be able to connect aerial and earth and speaker or phones and start tuning in stations. If the set does not show signs of life, it is most likely that there is an error somewhere in the wiring and the best plan is to check again with the circuit.

For those who have instruments or can borrow them, the high tension voltage, measured at the junction between the 6800 ohm resistor and the speaker transformer, should be about 150 volts. The total high tension current should be between 6mA and 7mA. ▬

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A READER BUILT IT!

Circuits and devices which we have not actually tested in our laboratory but published for the general interest of beginners and experimenters.

PHOTO-CELL TURNTABLE STOP

he following contribution is from Mr. R. H. Riordan, 15
egent St., East Brighton, Victoria. It describes a novel auto-
natic stop for a gramophone turntable and, quite apart from
s practical value, should appeal to those readers who like
experiment with such circuits, either to improve them, or
to adapt them to some other requirement.

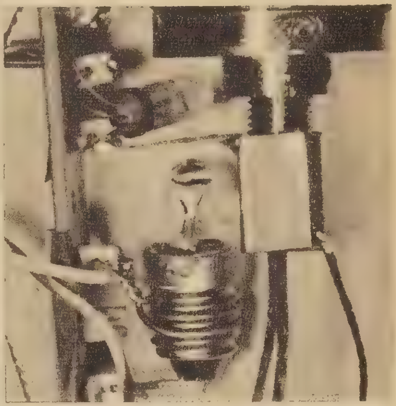
ie time ago I purchased a Lab-
turntable with All Balance Arm.
ugh this was perfectly satisfactory
cally my pleasure was soon damp-
by the absence of an automatic
nechanism. After some thought I
d a photoelectric mechanism
has proved to be completely satis-
y. As it is relatively simple, in-
a minimum of interference with
urntable, and does not load the
in any way I feel that other
s would also be interested.

basic components are a small
brass vane which clips onto the
spindle, a small lamp and photo-
tor mounted nearby, a switching
operating a relay which controls
wer to the turntable, and a power
operated from the filament wind-
the amplifier.

The lamp and photocell can conveniently be mounted on a bracket under the pickup mounting nut, and should be aligned experimentally for maximum sensitivity. The vane should be adjusted so that light starts to fall on the photocell when the pickup reaches a radius of about 3in and increases in intensity smoothly over the next 2in. The lamp voltage should be adjusted so that the phototransistor is just saturated when it is fully illuminated. In my unit this requires 1 volt on the lamp which should therefore have a long life.

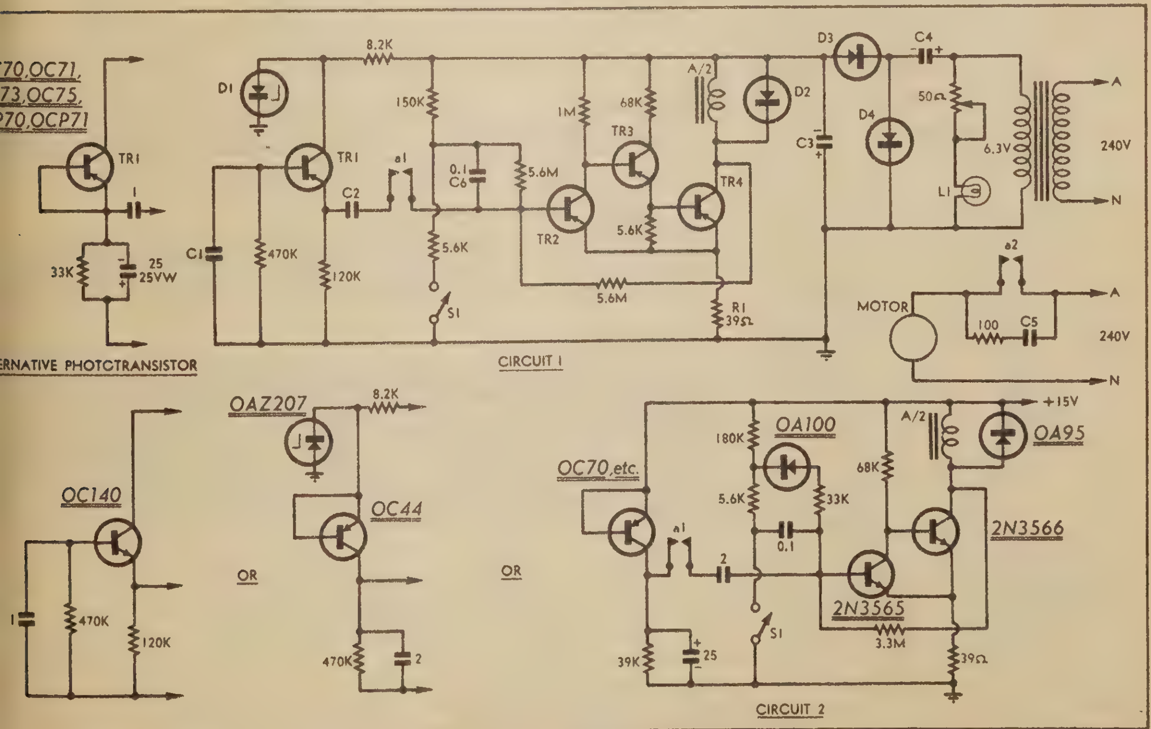
The switch circuit responds to rate of change of phototransistor voltage, corresponding to velocity, and switches off when the voltage rises suddenly by a predetermined amount. (It is essential that the unit is made to respond to an INCREASE in intensity, otherwise the

(Continued on Page 85)



Lamp, vane, and phototransistor mounted beneath the motor board. The vane is clipped to the pickup spindle.

The upper circuit is the one discussed in the text. The small circuit to the left covers alternative phototransistor types, and the lower one is suggested as a more modern version, but has not been tried.



70,OC71,
73,OC75,
70,OCP71
TR1
1
33K
25
25VW
ERNATIVE PHOTOTRANSISTOR
D1
8.2K
150K
TR1
C1
470K
C2
a1
120K
0.1
C6
5.6M
5.6K
S1
1M
68K
TR3
TR2
5.6K
TR4
5.6M
R1
39Ω
A/2
D2
D3
C4
D4
C3
50Ω
6.3V
L1
A
240V
N
a2
MOTOR
100
C5
A
240V
N
CIRCUIT 1
OC140
1
470K
120K
OR
OAZ207
8.2K
OC44
470K
2
OR
OC70,etc.
a1
2
39K
25
S1
180K
OA100
5.6K
33K
0.1
68K
A/2
OA95
+15V
2N3566
2N3565
3.3M
39Ω
CIRCUIT 2

The tape recorder comes of age..

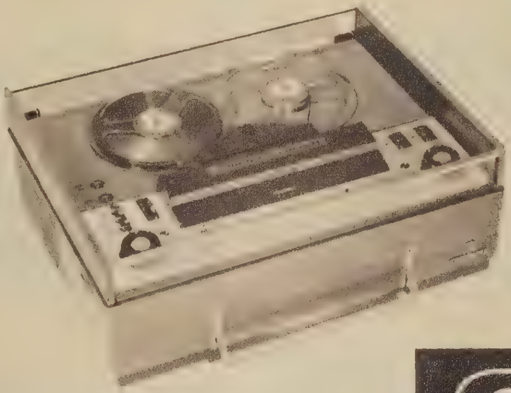
Grundig TK340 series.

The tape recorder was a squawky contrivance in the early days. Oberlin Smith spotted its happening before it happened, in an article in "The Electrical World," as early as 1888. A Danish inventor, Valdemar Poulsen, was the first to reduce the idea into practice with a recorder which stored the electrical signals on a wire of magnetic steel. In 1927, J. A. O'Neill received the first U.S. patent for magnetic tape as we know it today, made by drying magnetic particles on the surface of a strip of paper.

The tape recorder has c
quite a way since then. Now
1966, after many years of G
dig research, the tape recor
comes of age with Grund
mighty TK340. The TK340 i
sophisticated three-speed, th
head, four-track, full ster
mono machine. Separate rec
ing and playback amplif
mean that the horizons of
TK340 owners are limitl
Many extra devices incl
facilities for multiple synch
ization, sound-on-sound moni
ing via tape and the recording
echoes—all switch controlled

GRUNDIG
GRUNDIG
MONO
QL
QR
ON OFF
RECORD
1 2
3-4
STOP
START
FAST WIND

TK340/TS340: SPECIFICATIONS. TRACKS (international standards): 4. Tape speeds: 4.75 cm/sec. (1⅞ ips), 9.5 cm/sec. (3¾ ips), 19 cm/sec.
7½ ips). Frequency response: 4.75 cm/sec., 40-10,000 cps; 9.5 cm/sec., 40-15,000 cps; 19 cm/sec., 40-18,000 cps. Max. playing time (duo
ape): 16 hrs. (monaural, 4.75 cm/sec.). Tape spool: 18 cm (7'') max. Output stages: 2 x 8 W (music power 2 x 12 W). 2 perm. dyn. speakers:
½'' x 4½''. Tube complement: (6) 2 x EF 86—2 x ECC 81—EL 95—EM 84. Selenium rectifiers: (4) B 250 C 100—B 30 C 1200—2 x M 3.
Transistors: (12) 4 x BFY 39 111—2 x BSY 76f—2 x AC 127/AC 152—4 x AD 150. Diodes: (3) 1 x DZ 62—2 x Z 1, 5. Voltage: AC, 50/60
cycles. Convertible: 110, 130, 220, 240 V. Power consumption: appr. 80 W. Push buttons: start, stop, recording track ½, recording track ¾,
synchr. rec. (SYN), rec. Test control (CON), playback track ½, playback track ¾, mike, radio, amplifier, temp. stop, cleaner for tape. Slide
control: rewind—fast forward. Controls: rec. level (for both channels), mixer for sound-on-sound + echo, volume control (one for each
hannel or simultaneously for stereo), tone (base + treble). Switches: tape speeds, mains on-off, sound-on-sound record. Sockets—inputs:
icro, 2 x 2 mV/1, 5 MΩ; radio, 2 x 2 mV/22 kΩ; phono, 2 x 100 mV/1 MΩ; Teleadaptor, 244 U. Outputs: highly resistive, 2 x 600
V/15 kΩ; low resistance, 2 x 5 Ω. Features: tape counter, automatic end-of-tape stop, built-in tape joining channel, tape cleaner, echos
w/a delay of 840, 420, 210 ms. Remote control solenoid (footswitch) can be added F 40. Dimensions: 21 x 16 x 8¼'' approx. Accessories:
microphone GDSM 202, connecting lead 242, cassette with long-playing tape GD 18.



e sleek Grundig cabinet hides
polished steel chassis and
in parts. Two output stages
built-in loudspeakers give a
al output of no less than 16
tts! (R.M.S.). It's ideal for use
a public address system and
Hi-Fi amplification of any
nd source. That's why the
340 has an amplifier switch
ed as standard. The TK340's
akers allow superb stereo
yback without the need of
litional extras, but facilities
provided for the connection
stereo loudspeakers to extend
separation of the two sound
nnels.

The TS340 is a distinguished-looking stereo tape recorder with identical specifications to the TK340 housed in a beautifully finished case with the modern teak look, a fold-away handle and a thick, polished perspex lid. Overall dimensions are the same. So is the amazing quality and versatility of the sound. The TS340 is, simply, the machine for those who demand the ultimate in a tape recorder.

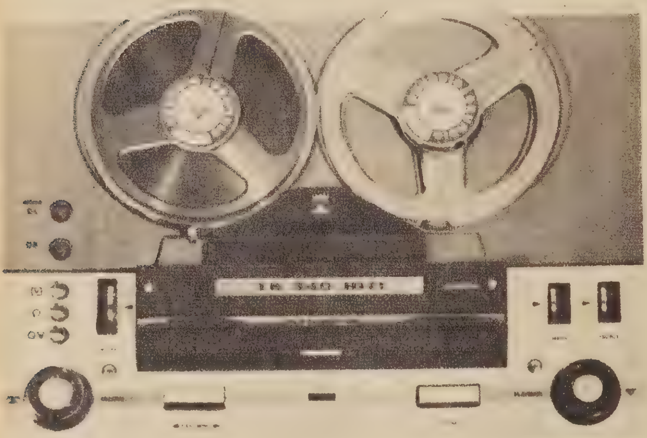
GRUNDIG

GE:P341/1

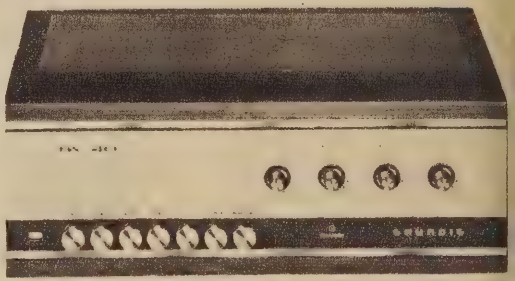
GRUNDIG
GRUNDIG
CON. SYN 1 2 ▼ 3 4
BASS
PLAYBACK
PAUSE

For a sophisticated tape deck... sophisticated gear

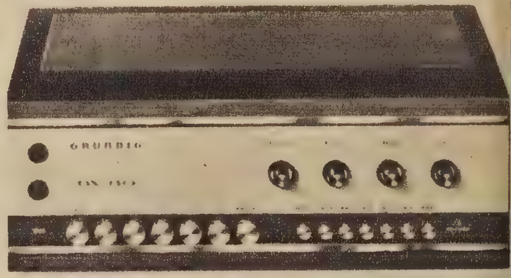
All the imposing specifications of the TK340 are available in Grundig's finest tape deck—the TM340. A tape deck so sophisticated and advanced, it could become the dominant part of your hi-fi studio. For added flexibility Grundig accessories such as mixers, microphones and speakers are available.



For a transcription unit, the most likely companion for the TM340 is the Goldring-Lenco GL.70. This precision engineered transcription unit is built to instrument standards of quality. Designed for monaural or stereo reproduction, it is fitted with the L.70 pick-up arm which has a detachable plug-in shell. Features a dynamically balanced 8 lb., die-cast turntable of zinc and copper alloy. Its lapped centre spindle runs in a sintered bronze busk with a special thrust pad to keep wow and flutter at less than 0.2%. Standard playing speeds are located by pre-set click-in positions but the unique vertical drive system allows continuous adjustment. The pick-up lowering device incorporated in this unit is coupled to the manual on/off switch so that the pick-up can be manually raised or lowered onto the disc. The GL.70's specifications are detailed on the opposite page.



The SV40 is a fully transistorised Hi-Fi amplifier with a distortion factor of less than 0.5%. With 25 transistors and 7 diodes, it has a channel separation of better than 40 db and a frequency response of 20-20,000 cps ± 1 db. Output is 20 watts (R.M.S.) per channel.



The SV80 features 29 transistors and 9 diodes, better than 46 db channel separation, 20-20,000 cps ± 1 db frequency response. Distortion factor is less than 0.5%.

The choice of amplifier for your studio system must be out of either the Grundig SV40 or the SV80. Both are the ultimate in solid-state components — giving incomparable performance in keeping with today's standards.

Grundig have a range of speakers to suit Hi-Fi studio requirements. A full range of Grundig speakers can be seen at the Grundig Sales & Service Showroom in your State.

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GE:P341. 2

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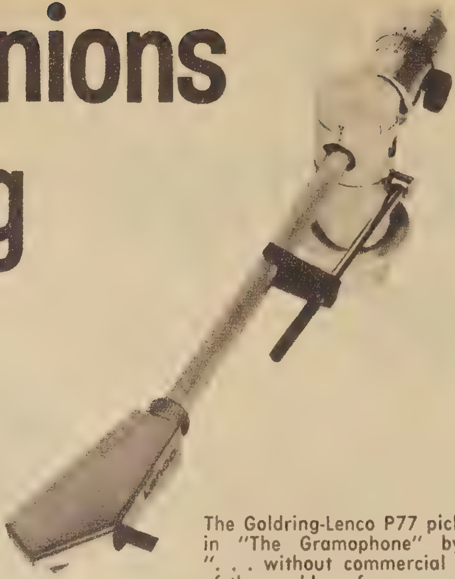


transcription unit (as described on the opposite page)
FICATIONS: AC mains 200-250v. 50 c.p.s. 4-pole con- velocity motor (15 watts). Continuously variable adjustment. Positive click-in positions for 16, 33⅓, nd 78 r.p.m. 8-lb. non-magnetic balanced turntable. e spindle of ground and lapped steel in sintered e main bearing. Wow and flutter—maximum 0.2%. le and hum—negligible. Less than 1% speed change 13% mains voltage change. Positive drive and letely accurate speed control through the al drive system. Pick-up arm—L.70 with hable head shell and adjustable playing t. Built-in pick-up lowering device. natic disengagement of idler . **DIMENSIONS:** 15¾" wide x nigh. Turntable diameter 12".

Goldring G99 transcription as been developed for those enthusiasts who require a of high transcription quality ish to fit a transcription arm of own choice. It offers complete om in mounting arrangements. The designed by a famous industrial de- r, has many highly successful mechanical res, such as infinitely variable speed adjust- and automatic idler wheel disengagement. **FICATIONS:** AC mains 200-250v. 50 c.p.s. 4-pole con- velocity motor (15 watts). Continuously variable control. 8-lb. non-magnetic turntable. Neon-lit oscope. Centre spindle is of lapped, hardened steel tered bronze main bearing. Wow and flutter—less 0.2%. Rumble and hum—negligible. Turntable speed s than 1% variation for 13% mains voltage change. positive drive and accurate control through precision al shaft and vertical idler wheel. Automatic dis- gement of idler wheel. **DIMENSIONS:** Front to back, Side to side, 13¼". Turntable diameter, 12". Clear- required above motor board dependent on the arm Clearance required below motor board, 3".

GOLDRING
OFF

The Goldring-Lenco P77 pick-up arm is described in "The Gramophone" by Percy Wilson as: ". . . without commercial superior at any part of the world, so far as my researches have gone, and, as readers know by now, they have been extensive."

The Swiss engineers who developed the new P77 have not only achieved a significant technical advance but have paid the genuine connoisseur the compliment of arguing that he does not need to see masses of intricate mechanism to convince him that an instrument is good. The P77 is beautifully proportioned, can be balanced in all planes (can even be mounted vertically on the wall!), and can change heads as often as you like. An adjustable mounting plate in the head shell allows the achievement of a stylus position that will give minimum tracking error. The calibrated dial at the top of the pedestal is used to set stylus pressure, irrespective of stylus changes and without using a separate pressure gauge. The lever applies a gentle hydraulic brake so you can poise the stylus precisely over the record. The stylus will descend as slowly for 8 grams as for ½ gram. The P77 is truly a precision instrument. **P77 SPECIFICATIONS:** Overall length of pick-up arm, 330 mm. (13"). Diameter of pedestal, 34 mm. (1.34"). Overall height with screening can, 150 mm. (5.9"). Maximum height adjustment, 30 mm. (1.18"). Tracking length (turntable spindle to pedestal spindle), 210 mm. (8.27"). Stylus overhang, 17.1 mm. (0.67"). Maximum adjustment of stylus position, 10 mm. (0.39"). Offset angle, 23° 12′. Tracking error, ± 0.8°. Length of cable, 1.10 m. (43"). Capacity (plug-in shell to amplifier input), 160 pF. Moment of inertia (without cartridge), 148 grs.²/mm. Low frequency resonance with cartridge of compliance, 5 x 10 ^{6} cms./dyne 10 c/s.

GRUNDIG

For its moderate price, Goldring's G.66 integrated hi-fi turntable would be hard to better.

The G.66 incorporates features found only in high-quality transcription units: A Swiss-made precision mains motor; an accurately balanced turntable unit with a hardened steel ground and lapped centre spindle running in matched bearings; a thin-wall diecast aluminium arm, combining minimum weight with maximum strength, mounted on a precision ball race; provision for full stylus pressure adjustment; a plug-in interchangeable head shell.

The on/off switch automatically engages or disengages the idler wheel and pick-up raising/lowering device.

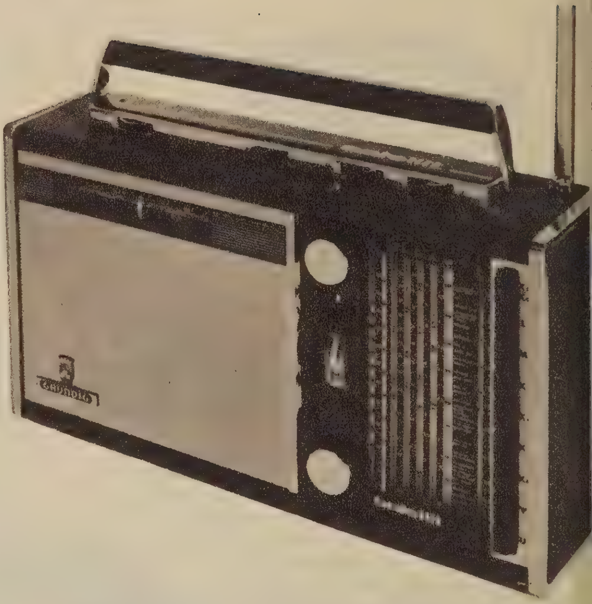
An eddy-current brake allows variations from standard playing speeds of up to 10%.

1/3

Grundig world-range radios

TR5000

The Grundig name has become a legend for quality in radio sound. And with radios like the extraordinary Grundig Sattelit, it's no wonder! You can be an eavesdropper on the world. Two Superphon dynamic loudspeakers give you world-wide reception on thirteen wavebands—with an unbelievable depth and clarity of sound. Short wave, FM, bandspread, too! The Satellit TR5000 is designed to operate on batteries or AC mains, and receives VHF/FM, long, medium and short wavebands. The short wave coverage ranges from 10 to 187 m., split into four bands.



Additionally, six bandspread short wave ranges are provided, shown on a separate scale with a rotating drum selector. The Satellit is fitted with 17 transistors and 11 diodes. It features a short wave fine tuning dial, automatic frequency control on FM, R.F. stage, a switchable ferrite aerial, a double extension telescopic aerial, a separate control for the bandspread short wave tuner, duplex drive on FM/AM, a tuning and battery indicator, and two multi-octave loudspeakers. The Satellit also has an illuminated tuning scale and separate bass and treble controls. Sockets are provided for headphones, external aerial and earth, car aerial, record player, tape recorder and external battery power supply.

The Satellit transistor 5000 has a handsome padded graphite case with chrome and satin silver trim. It measures 16" x 10" x 4¾".

TR3000

The Ocean Boy TR3000 is not just a transistor radio, it is a perfect piece of precision engineering. The whole world's your oyster with the Grundig TR3000. Choose a wavelength by pressing one of the nine buttons and using the fine tuning control. See visually when you are at the point of best reception by the tuning indicator (which doubles as battery indicator). Adjust the bass and treble tone controls and you're hearing a radio that's built for listening to, not straining at. The Ocean Boy has two loudspeakers, 13 transistors, 8 diodes and 2 rectifiers. Provides matchless listening on VHF/FM, long, medium and 4 short wavebands (10 to 185 m.). Output is up to 2 watts (R.M.S.).

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GE:P34

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will switch off the first time the
gerator starts.)

ie capacitor C1 filters out ripple re-
ig from the AC filament supply,
letermines the time constant of the
rentiating circuit, and R1 controls
threshold, or quick movement, re-
ed to trigger the switch. This should
bout 3/16in — just a little more
the intertrack separation. The diode
suppresses the relay switch-off
ient which would otherwise damage
output transistor.

ie turntable is started by removing
pickup from its rest, thereby closing
ch S1, which originally controlled
turntable directly, and stopped by re-
ing the pickup to its rest. If this
ch is not available an on-off toggle
ch could be used instead.

is important to use a suitable com-
tion of relay contacts. The con-
used for the 240V mains circuit
should be suitably insulated to en-
completely safe operation at this
ge. The low voltage contacts (a1),
he other hand, should be capable of
iding reliable low resistance opera-

ie .047uF capacitor and 100 ohm
tor should be mounted directly
ss the relay contacts, and the relay
ld not be too close to the pickup
ig.

me care should be taken with the
ig to avoid tripping by interference.
articular the leads associated with
C1, and Tr2 should be reasonably
t and should not be bundled up with
carrying 240V. Provided the fila-
t winding is earthed at the amplifier
hould not be earthed at the unit,
rwise circulating currents may cause
pickup. In principle the unit would
ate equally well with the centre tap
ie filament winding earthed although
cing would be trickier.

ie general nature of the components
be determined from the circuit, but
following list gives additional details
h may be helpful. It is NOT a
plete parts list.

l, C2, 1.0uF 125VW Polyester.
3, C4, 500uF 25VW Electro.
5, 0.047uF 600VDCW Paper.
6, .1uF 125VW Polyester.
r1 "OCP44" (OC44 in glass envelope
paint removed).
2, Tr3, OC702.
4, OC75.
1, Z10 (OAZ207).
2-D4, OA95, OA200.
l, 2.2V Lens end pencil torch bulb.
elay A/2 1000 ohm 3000 type relay
one normally open contact, and one
voltage normally open contact.

he original unit was built several
s ago using components on hand at
time and is now decidedly out of
. For those wishing to use modern
ponents circuit 2, which has not been
l, should serve as a basis for ex-
ment. The phototransistor could be
ost any type in the old style glass
elope with the paint removed, the
l4, 45, 70, 71, 73, 75, or 140 all
g suitable. The OCP70 or 71 will
do, but these are much more ex-
sive and their performance is not
ificantly better. A photoresistor of
CdS type could probably also be
l if the circuit were modified ac-
lingly.

ditor's Note: The author of this
le did not provide a detailed expla-

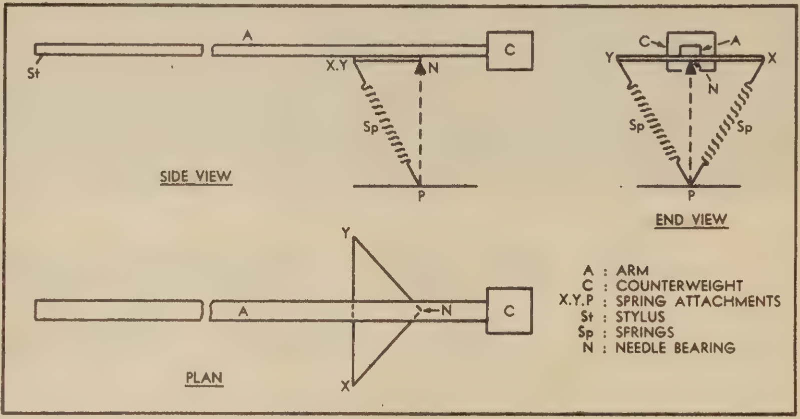
(Continued on Page 158)

BALANCED, UNIPIVOT PICKUP ARM

Mr J. Vorrath, 103 Hotham St., East Melbourne, has developed a novel pickup arm. He has taken out a provisional patent on the device, and we present his own description of it.

The two essential features of this novel pivot system are:

1. A needle bearing which has:
   (a) its seat at the centre of gravity of the pick-up arm, and
   (b) its needle pointing vertically upwards in a fixed position relative to the turntable. ("Vertical" in this case is used to mean "perpendicular to the plane of the turntable.")



These drawings demonstrate the general principle of the unipivot arm. Compare them with the photograph below.

2. Two tension devices which are symmetrically disposed on either side of a vertical plane passing through the stylus point and the needle bearing.

The lower ends of these tension devices are attached to any fixed point vertically below the needle bearing.

The upper ends of these tension devices are attached to two points on the pick-up arm which are:
   (a) Both in the same horizontal plane. ("Horizontal" in this case is used to mean "parallel to the plane of the turntable.")
   (b) Each the same distance to either side of a vertical plane passing through the needle bearing and the stylus point, and
   (c) each the same distance closer to the stylus relative to a vertical plane passing through the needle bearing at right angles to a line joining the stylus point and the needle bearing.

Below are listed the desirable features of a pick-up arm which uses this novel pivot system.

1. Very low lateral resistance because there is very little friction in the single needle bearing and only very small torsional forces develop in the tension devices. The lateral forces produced by each tension device are equal and opposite and therefore self cancelling.

2. Minimal vertical resistance because the only friction involved is that in the single needle bearing.

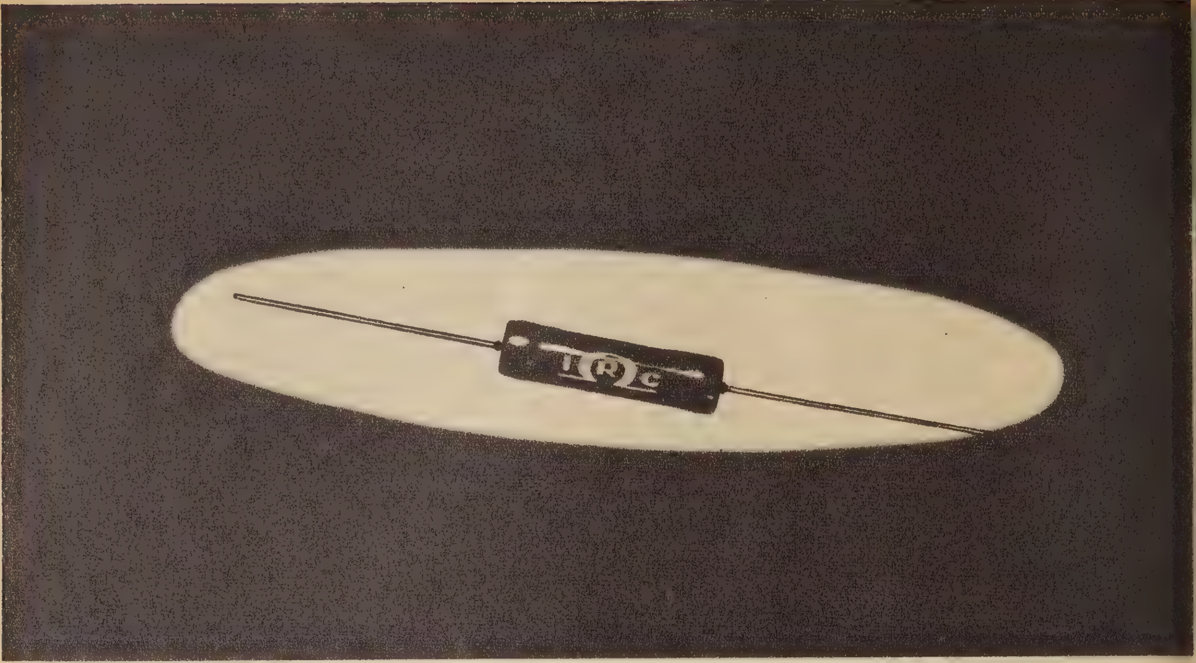
3. There is transverse stability because the tension devices prevent rotation of the arm around a line joining the stylus point and the needle bearing.

4. The arm is dynamically balanced and acceleration of its suspensory system does not produce rotational tendencies in the arm.

5. Performance of the arm is independent of gravity because the tension devices produce the tracking force. Therefore the turntable can be operated in any plane.

6. Ease of construction and minimal maintenance because there are only a few simple component parts. ■

One version of the arm mounted on a commercial turntable plate.



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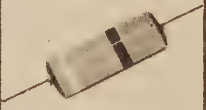
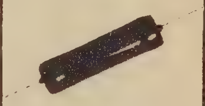
 Miniature insulated carbon composition ¼ to 2 watts Bulletin BT62A	 Miniature insulated wire wound ½ and 1 watt Bulletin BW62A	 Miniature insulated R.F. chokes Bulletin H	 Deposited carbon High stability ⅛ to 2 watts Bulletins DM and DC	 Variable carbon and wire wound Bulletins CTS and 2W	 Evaporated metal film ¼ and 1 watt Bulletin CC

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thyristor or Silicon Controlled er (SCR) is a four-layer PNPN device similar in many ways to ur-layer or "Shockley" diode. Its ion depends upon the same two l principles: regeneration due to ternal amplification produced by NPN configuration, and the char- tic dependence of current gain current level in silicon devices.

vever the difference between the evices lies in the means employed tch the device from the non-con- g or "off" state to the heavily con- g "on" state. Whereas in the case PNPN diode the switchover is d simply by raising the applied until the **leakage current** is itself produce regeneration, in the case thyristor the current level is raised eneration point by **injecting car- rom an external circuit.**

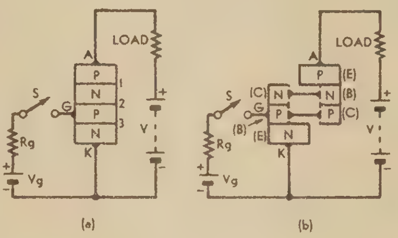
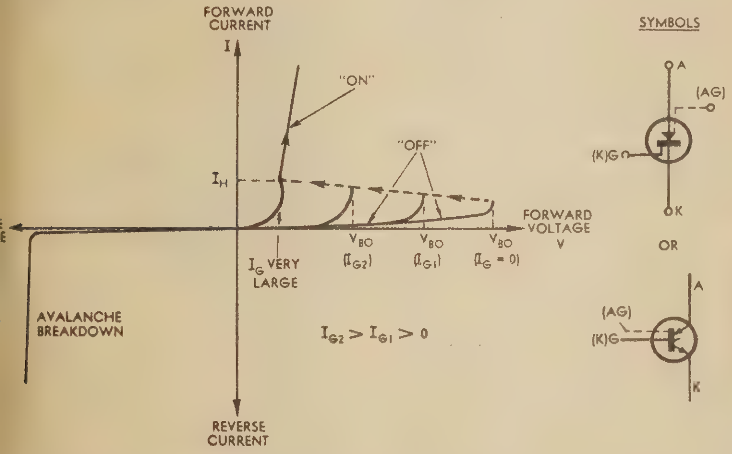


Fig. 1

Two diagrams used to explain thyristor operation. At right is a typical device.



characteristic curve of the thyristor, showing the dependence of akdown voltage upon gate current. The lower symbol is preferred.*

hown in figure 1 the end P-type s called the anode, as before, and d N-type layer the cathode. In n a connection is made to the P- ayer adjacent to the cathode, this tion forming the "gate" electrode. th the PNPN diode the structure be considered equivalent to two mentary transistors, with the gate de connecting to the base of the "transistor" — figure 1(b).

n connected in series with a load suitably polarised source of cur- , junctions 1 and 3 are forward and offer a low resistance. How- unction 2 is reverse biased and ts the flow of appreciable current state the thyristor draws only current and is virtually open- or "off."

initiate switch-over to the "on" a small forward bias is applied to ver P-N junction (3) via the gate electrode. As this has the effect of injecting minority carriers (electrons) from the cathode layer to the gate layer, it raises the gain of the internal NPN "transistor" to the point where regeneration occurs.

In effect, the gate voltage and resulting current control the "breakover" voltage **Vbo** of the anode-cathode structure. The higher the gate current, the lower the voltage at which the anode-cathode circuit switches from "off" to "on." This is illustrated by the curve shown in figure 2. For zero gate current Vbo may lie between 50 and 1200 volts, depending upon the device; with sufficient gate current it may be reduced to as low as 0.5V.

Note that although the gate electrode is normally connected to the centre P-type layer, it is quite feasible to use instead the adjacent N-type layer. (In this case it is virtually the internal PNP "transistor" which initiates switch-on.) Some thyristors intended for special purposes are provided with connections to **both** central layers, giving an "anode gate" (AG) and a "cathode gate" (KG).

Once the thyristor is "on," it generally stays in this state until the supply voltage is removed — or at least until the current flowing falls below the critical "holding current" (Ih). The thyristor thus behaves rather like the thyratron valve, in that once having initiated conduction the gate electrode has little effect.

However in contrast with the thyratron valve, it is possible to arrange the PNPN geometry and impurity doping levels so that the gate electrode may be used to turn the device "off" as well as "on." Devices designed with this in view are usually called Silicon Controlled Switches (SCS), Gate-Turnoff Switches (GTS), or Silicon Unilateral Switches (SUS).

Thyristors and SCSs are used widely for efficient controlled power rectification, AC power control, power switching and high-voltage-and-high-current logic. Large water-cooled thyristors can control currents of up to 800 amps and higher at 1200 volts. (J.R.) ◘

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the "Answer Man" Explains

ELEVISION — CATV & Translators

The first question, this month, is quite straightforward at first glance but leads into something which is the subject of a lot of argument, currently, in the U.S.A. It may ultimately become a lively issue in this country.

What are the CATV systems I see nentioned in American radio journals? re they the same as our local tele- ision translators?

No, they're quite different. But let's fill the background.

n all countries with a television ser- e, one is likely to find small, but nificant pockets of population which uld get a television service, but don't. nerally, they are within normal reach high-powered stations but are dowed from the signal by local ography.

To such a community, it is highly strating to know that usable television nals are right above their heads, but of reach of any practical backyard rial.

Suggestions which spring to mind, to rcome this problem, include aerials on of a handy ridge, with cables to lead signal down the hillside, or feeding ondary aerials to radiate the signals wnward. Both ideas have very limited fulness, however.

Another scheme is to put an aerial top of the ridge to pick up distant signals, then amplify them and radiate them through other aerials o the area to be served. A couple of ty problems arise here: One is to eive, amplify and radiate on the same quency without having the whole sys- n run into regeneration and instability; other is to avoid phase interference adjacent areas capable of receiving h the direct and the re-radiated signal.

Because of these problems, local re- adcasting of television signals nor- lly makes use of the translation prin- le: The incoming signal is received a suitably placed aerial system, then plified and frequency-shifted by a erodyne process, to another recognised evision channel, which is not occupied any other station in the area. This w signal is then radiated into the dowed area, usually at very low wer. The frequency shift obviates the blems of instability and interference t direct amplification involves.

A good deal of care is necessary in ng and operating translator stations, cause their signals can easily stray fur- r than intended and add to the already ious problems of fitting too many tele- ion transmitters into too few channels. That is why the authorities in Australia and New Zealand have strenuously opposed free-lance installation of translators by local groups. They insist that each translator has to be considered on its merits in relation to the overall planning of the television service.

CATV is a parallel approach to the problem, now being widely adopted in the U.S.A., where the TV channels are virtually choc-a-bloc — and then some. It stands for Community Antenna Tele-Vision. From an initial venture in Pennsylvania, in about 1950, something like 1,700 CATV systems have since been set up in the country, with a growth rate estimated at about 40 per month.

Basically, a CATV system begins with a tower and a receiving aerial system set up on a ridge, where good signals are to be had. The signals are amplified but, instead of being re-radiated, are fed into a coaxial cable system running throughout the shadowed area. "Subscribers" pay so much for a connection to the cable, and for access to the signals which it carries.

The idea sounds simple enough, but it has its special quota of problems, technical and otherwise.

Signals tend to be attenuated quite severely along the cable, making it necessary to install repeater amplifiers every here and there. The amplifiers have to exhibit wide-band, low-distortion characteristics, to handle successfully all signals fed down the cable, without producing intermodulation effects. These include "window blind" and "windscreen wiper" effects, due to blanking and synchronising pulses from one channel being superimposed on another.

The gain of the repeater amplifier has to be tapered, in terms of frequency, to complement the characteristic of the cable, which generally exhibits an attenuation increasing with frequency.

The level of all signals in the system has to be carefully (perhaps automatically) controlled, so that operation of the system is not upset by variation of the incoming signal levels due, notably, to changing propagation conditions.

Considerable care has also to be exercised in the cable system to maintain proper impedance levels and inhibit standing wave effects, which may produce television "ghosts." Special consideration has to be given to the way in which subscriber cables couple into the main reticulation cable, and to the transformers which are usually necessary at each receiver to couple their "balanced" input circuit to the "unbalanced" coaxial feed system.

An obvious not-so-technical problem which any CATV system faces is the attitude of the relevant authorities to yet another cable system traversing public streets and footpaths. It is interesting to note that the official position in U.S.A. is quite different from that which obtains in Australia, where the P.M.G. Department has long had a virtual monopoly of wire communication systems.

Further non-technical problems in the U.S.A. arose from the fact that CATV soon began to expand beyond the original concept of bringing television to communities which previously had no television service at all.

It began to appear in communities which already had a local television service but which were willing to subscribe to a CATV system able to bring them a wider choice of programs, because of the prominently placed aerial systems.

This produced opposition from local TV broadcasters, who naturally resented the "outside" competition, from theatre interests and from TV dealers and servicemen who saw money go to the CATV concern, which would otherwise have been spent on aerial installations.

Not surprisingly, the situation provided grounds for endless argument about TV set troubles, with servicemen blaming CATV and vice-versa for all the non-obvious faults.

CATV has also found a place in heavily built-up areas, where apartments, home units, factories, etc., complicate the problem of using regular aerials and receiving ghost-free signals.

A still further expansion has been to

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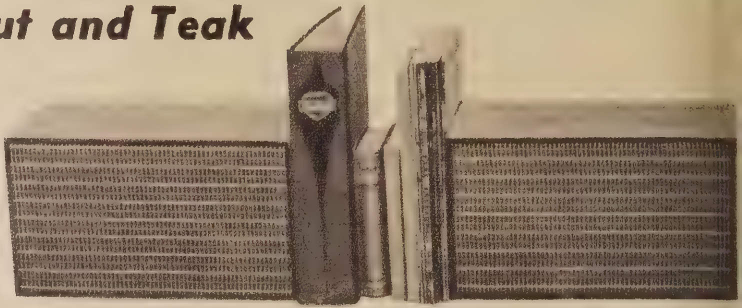

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ed into the cable programs from FM ations, along with locally generated rriers carrying background music, ne and weather services, educational aterial and local government activities.

Some CATV services are even begin- ng to "swap" programs over micro- ave links, with French-speaking and anish-speaking programs leap-frogging e borders from adjacent Canada and exico.

In fact, it has transpired that CATV bscribers in some fortuitously placed mmunities in the U.S.A. have a wider oice of TV and FM programs, plus mmunity services, than people living the major cities.

Statistically CATV is still fairly small comparison with regular television ogramming, the 1700 systems which rrently serve 1.7 million homes repre- nting only 3 per cent of the total audi- ce. However, the potential impact of ATV on the financial structure of U.S. evision stations is such that the F.C.C. s stepped in to limit its expansion in etropolitan areas, while it has also n into problems to do with program pyright.

From being just a way of getting evision to an "under-privileged" com- unity, CATV has, in fact, grown up o a major issue in the U.S. communi- tions scene.

★ ★ ★

I have seen reference in an American magazine to testing loudspeakers by listening to another loudspeaker. This seems a crazy idea to me—or have I missed something?

Superficially it does sound like a crazy a but it isn't. We can only assume. erefore, that you have missed the vital int.

Assessing the performance of loud- eakers is a thorny problem because is very difficult to verify all their per- rmance criteria by pure instrumenta- n. In large degree one is forced back subjective judgment of the perform- ce and one therefore runs into all the ubts and arguments that subjective dgment is likely to involve.

In listening tests observers are likely assess a loudspeaker in terms of their uitive likes and dislikes. Some people efer sound with plenty of bass some th plenty of treble, some with plenty middle response, and so on. They e likely to express judgment coloured such preference.

Bound up with this is a possible dom- ating interest in certain types of music program.

Listeners who happen to have a special terest in trumpet or solo voice tend to y particular attention to program aterial containing this kind of sound. may well be projected better by a udspeaker having a fairly prominent ddle register euphemistically described a good "presence" characteristic.

But listeners who are more interested percussion or strings will have their rs cocked for the high frequencies, ot "muddied up" by excessive middles!

And, of course, pipe organ enthusiasts ve their bass—and so on.

Some of this personal preference can inhibited by resort to comparative chniques, using a carefully chosen and ried program material, with suitable terspersed comment.

The simplest such technique is that comparing the loudspeaker under test th one of known and established ality. By simply switching from one the other (making simultaneous compensation for any difference in level) a ready comparison can be obtained.

The obvious problem is to find — and retain for the purpose — a loudspeaker which all concerned are prepared to accept as a worthy reference standard. As soon as someone begins to introduce "ifs" and "buts," the whole validity of the operation comes into question.

What's more, if the loudspeaker under observation approaches the quality of the reference speaker, the observers begin to have doubts. They are likely to be unanimous that the loudspeakers are different but quite uncertain as to which is actually the better!

A more reliable basis for assessment is the idea of having an announcer and instrumental group available in a suitable studio, recording their performance on a high quality system and playing it back into the same studio, through the particular loudspeaker (or loudspeakers) concerned.

When observers are able to make rapid comparison between the original and reproduced sound, they are in a much more favourable position to pick out any lack or colouration introduced by the loudspeaker. (Perhaps one should remark that the operation assumes the use of microphone, amplifier and recorder, which have characteristics well in advance of the loudspeaker under test—this would normally be the case in a professional studio situation.)

But this elaborate test set-up has its own serious problems. There is the obvious one of having a musical group available, equal to the task. There is the further one of getting some kind of symmetry into the listening situation, so that the loudspeaker is not at too much of a disadvantage in relation to a physically dispersed and visually "interesting" orchestra. These and other problems are such that this kind of assessment can rarely be attempted.

The idea that apparently triggered off this question is a much more practical one. It involves obtaining a suitable collection of program material on half-track tape, with facilities to play it through a good amplifier and a reference loudspeaker system that must have a wide frequency response, though it need not be especially smooth.

This loudspeaker must initially be placed in a situation which is as dead as possible acoustically. A large anechoic chamber is just about ideal; a quiet open-air situation is a reasonable substitute. The material on the tape is played through the reference loudspeaker, picked up by a high quality microphone and recorded on the other half track of the tape.

The tape now contains two lots of material: The original high quality program and, alongside it, a version of the program, as reproduced through the reference loudspeaker and "heard" by the microphone. Assuming that the microphone, its "listening" environment and the recording system have had minimal effect on the sound, the contents of the second track will be substantially governed by the colouration of the reference loudspeaker.

The reference loudspeaker is now taken and set up in a suitable listening room and arranged to operate, through an amplifier, from the original program material on the tape.

The loudspeaker to be assessed is stood alongside the reference loudspeaker and arranged to be fed, through a similar amplifier, from the second track on the tape.

A switch is provided to change immediately from one system to the other, the levels are carefully balanced, and the set-up is ready for the observers.

A little thought will show that, if the loudspeaker to be assessed were perfect, it would not add any colouration to the sound being reproduced through it.

Therefore, the sound heard from both loudspeakers would be virtually identical: (1) the reference loudspeaker projecting its natural version of the original material into the listening room, and (2) the loudspeaker under test reproducing an unaltered replay into the same listening room of the reference loudspeaker's earlier performance.

The exercise is purely one of judging how closely the sound from the loudspeaker under test matches that from the reference loudspeaker. If it matches closely, then the loudspeaker under test has a low order of colouration. If it modifies the balance or sound perceptibly, then it is adding colouration of its own and would add this to any other sound being reproduced.

With this procedure, it is quite immaterial whether the observers like the type of program or the general weighting of bass, middle and treble. All they are asked to judge is how closely the sound from the loudspeaker under test resembles the reference sound.

And, of course, the beauty of it is that this test can be carried out at any time of the day or night and, given a good two-channel (or stereo) tape playback system, it can be set up in any listening environment to run tests on any number of loudspeakers.

The original exercise in the anechoic chamber or open air only has to be done once, provided the reference loudspeaker is carefully preserved and protected from treatment which might alter its characteristics.

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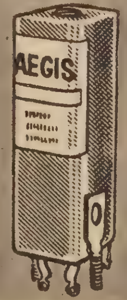

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AUDIO TOPICS

UN WITH A TAPE RECORDER

A new dimension has been added to person-to-person correspondence in recent years. The written word is being supplemented by the voice, by means of a microphone, a magnetic tape recorder, and 3-inch reels of magnetic tape. Mailed cheaply from one person to another, the tapes are bringing people together — individuals, families, clubs, and school classes.

By Edward Roesken

the writer's knowledge, at least recording clubs are currently ating, seeking to promote correspon- e between people who have tape rders.

hirteen of the clubs are based in the ed States. The others are in Aus- , England, Canada, Scotland, New and, Denmark, Norway, France, Germany and South Africa. They directories of members and their esses, giving the interests of each ber. By joining a club at a small a person can find congenial "tape ds" in forty or fifty or more coun-

ne ardent "tapespondent" numbers ng his friends in different countries entist in Australia, a High School ner in New Zealand, who recently ed him, a newspaperman in Canada mberman in Tennessee, a physician ndiana whom he recently visited, a ed banker in New York, an archi- in Dorset, England, a restaurateur evon, a mapmaker in Hampshire, a eraman in Gloucestershire, a college ner and a fire chief in Derby and a ype operator on the Isle of Wight. few of the clubs bring together e with special enthusiasms or inter- These include the Organ Music usiasts and the Catholic Tape Re- ers of America, International.

lost clubs are of an international acter, with names such as Tape- ms International Recording Club, rnational Voices of Youth, World Pals, World Wide Tape Talk, In- ational Tape Fellowship and Univer- Tape Network.

ome of the clubs have appointed re- entatives who instruct a new mem- via tape, in how to make an inter- g tape. All agree, however, that is no need for elaborate prepara- in the making of a tape; one talks as one would over the telephone.

the United States, many clubs are d to make their contribution in this to the "People-to-People" Program gurated by President Eisenhower now directed by him. They realise Program is promoting world under- ding at the level of the "common ."

ost of Taping: The equipment re- ed for tape corresponding is not expensive, when considered in the light of the pleasure it can give.

For instance, a portable, battery-operated transistor tape recorder can be had for about $A60. Costs of other recorders, operated by mains power gradually rise to over $A800, but the average home recorder is purchased from $A100 to $A400. A 3-inch reel of magnetic tape can be obtained for about $A2. Postage on a reel of this kind, sent to a person in the United States by airmail from Australia is A30c; a 7-inch reel sent by surface mail is $A1.00.

The message on tape is automatically erased when a reply is being made. A single reel of tape can be used repeatedly and usually shuttles back and forth between the correspondents indefinitely. Or, if one desires to keep a particular tape letter, a new reel and tape are merely substituted when replying.

P.M.G. employee, Brian Bowman, with his bride, the former Miss Daphne Walter, from Sussex, England. "Meeting" first as penfriends, Brian and Daphne Walter later bought tape recorders and began to exchange tapes, which led to love, engagement and marriage in Sydney on August 18 — 8 hours after Daphne arrived on the liner Northern Star.

When completed at the usual recording speed of 3¾ inches per second and ready for mailing, the 3-inch reel contains from 150 to 300 feet of tape, depending upon the type or thickness of the tape chosen. It runs from fifteen to thirty minutes. Both edges of the tape are used on nearly all recorders. For greater fidelity in recording music, some enthusiasts prefer a faster speed of 7½ inches per second, found on many recorders, but the majority of tape correspondents employ the slower speed of 3½ ips.

Upon receiving a tape, notes are made of what has been said. This is done for use in replying and for future reference. Tape senders often keep these notes in notebooks—one for each correspondent. While awaiting a reply, jottings are put down of subjects to be touched upon on the next tape. These may include an acknowledgment of a letter received between tapes, mention of a tape from a mutual correspondent with the latest news from him, or anything of interest which one does not wish to overlook when talking on the next tape.

Subjects of correspondence are unlimited. These often relate to current activities, hobbies, work, the international situation, politics, stories or music —any subject which may be of mutual interest.

While the 3-inch size reel is perhaps the most popular, there are also 4-inch, 5-inch and 7-inch tape reels. Tape is usually purchased on 7-inch reels and spun off on the smaller sizes. This often saves in the cost of tape. Discarded 3-inch 8mm movie reels are in common use in tape correspondence.

Slides, pictures: Many tape recorder owners prepare a commentary on tape to accompany the showing of their 35mm colour slides. Photographic enthusiasts often send these slide sets to their tape correspondents who have 35mm projectors. Frequently, a background of unobtrusive soft music is added as a background to the voice.

Slide sets which are circulated in this way are often comprised initially of pictures of the sender and his family, combined with scenes in and outside of his home, especially of the room in which the tapes are made and of the recorder and other equipment. Later shows may present scenes taken on holiday trips and places of interest in the sender's town or State.

In exchange, he receives similar shows depicting the area in which the recipient lives. When this is a foreign country, much is learned of that country, its people, scenery and customs.

A group of 20 or 30 postcards, in colour, of local points of interest, numbered serially and sent with an accom-

QUALITY HIGH-FIDELITY EQUIPMENT

FROM: AUSTRALIA DENMARK HOLLAND & AMERICA

BEOCORD 2000

The new B & O BEOCORD 2000 Tape Recorder is the ideal recorder for the discriminating tape amateur.

For the first time in the world you can have an amateur tape recorder with a built-in mixing panel for simultaneous mixing of three input signals.

Here for the first time, is an all-transistor Hi-Fi tape recorder with professional specifications, including:

- Synchronous motor of the Pabst type.
- Separate recording and playback heads.
- Recording quality may be checked at any time, either before recording (at the recording amplifier output) or after (at the tape monitoring amplifier output).
- Equipped with two V.U. meters.
- Three dual-input channels with slide-potentiometer adjustment.
- Professional standards for speed, wow, and flutter.

Output Power: 2x8 watts.
Sensitivity:
Microphone input: 150 uV.
Gramophone input: 2 mV/1000 c/s.
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Line Input: 45 mV.
Line Output Voltage: 800 mV.
Speaker Impedance: 3.5-10 ohms.

BEOMASTER 900 K

B & O's first all-transistor mains-operated stereo radio.

Specially designed 2-channel transformerless audio amplifier for reproduction of stereo gramophone records (power output: 2x6 watts).

No warm-up time — the BEOMASTER 900 plays the very moment it is switched on.

Special tape recorder point at signal level specified by international standards permits playing taped radio programmes over the receiver's audio amplifier and speaker system.

The BEOMASTER is an unusually smartly styled radio — long, low, and with elegant control knobs of steel.

Available in teak or rosewood.

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SRT 643 and SRT 643F. Labcraft 605 and 605L. Jobo and Beogram 1000.

BOOKSHELF SPEAKERS

Teak or Palisanda, various sizes. Example: Type B.

Height: 11¾in.
Width: 25¼in.
Depth: 11¾in.
Power Capacities up to:
10 watts constant.
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Frequency Range:
40 — 20,000 c/s.
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Number and type of speakers: 2 in a special system with carefully suspended membrane, 1 treble and 1 bass.

It is a rockwool lined enclosure, without peak resonance and with special pressurisation. Impedance: 3.5 — 5 ohms.

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The Clearway system is an extremely efficient solid state amplifier of 12 watts per channel, mounted in the base of the well-known Labcraft turntable.

It incorporates the B&O STL or All Balance pickup arm and has input for tape recorder or radio.

Speakers such as Clearway or B&O with a frequency range from less than 40 cycles to over 16,000 cycles and having low distortion will be suitable.

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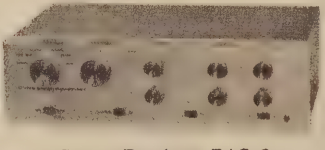

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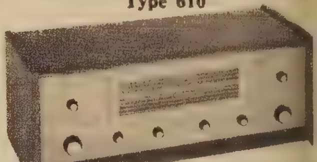
Type 610



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with the obsolescence-proof Hi-Fi ste
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It has two channels for both stereo a
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It has a special dial which displays
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Output Power: 2 x 15 watts.

COMPONENTS

B & O TYPE SP 6 —15° STERE
PICK-UP

Specifications:

Frequency response	20—2000 c/s ±2.5 dB.
Output.	7 millivolts p channel at 5 cn sec.
Channel separation.	Approx. 28 d at 500 c/s.
Stylus pressure.	Min. 1 gr., max. gr.
Compliance.	12—15x10^{-6} cn dyn.
Moving mass.	Approx. 1.5 mg.
Recommended load.	47000 ohms.
Mounting.	Standard ½in moun ing centres.
Spacing between stylus and mounting centres.	7.5 mm.
Weight.	Approx. 10 gr.
Stylus, spherical.	17 microns.

B & O TYPE SP 8 —15°

The B & O Type SP 8 — 15° Stere
Pick-up is of exactly the same mechanic
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is the elliptical stylus.

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anying tape, is also a popular and inxpensive extension of the slide show.

Round Robin Tapes: A "round robin" ape is a very popular activity with wners of tape recorders. This consists f a blank tape which is sent to the first n a list of persons in several counies. These are names of people with hom the sender corresponds and of thers of whom he has heard as being nterested in participating, who would ee that the tape continued on its ourse.

The sender may introduce himself at he beginning of the tape and ask each ne to devote a given number of inutes to making observations on a esignated subject. Or, he may suggest hat there be chosen by each "any ubject on earth or in outer space."

The first to receive the tape offers his houghts; each succeeding recipient ears what those before him have said nd can comment in the light of these rior remarks or choose his own subct. A very interesting and informative pe usually results for the sender and is tape library, giving him a cross-secon of thought in widely separated laces.

Tapes For The Blind: A number of pe recording clubs have a section of embers who record on tape music, ficon and non-fiction and other printed aterial for members who are blind or herwise seriously handicapped. One ub has a "Memorial Fund Tape ibrary for the Blind." This includes umerous fiction and non-fiction tapes nd many tape copies of magazines here the publishers have given perission to reproduce their publications this way for the blind. This club has taped course in "Fundamentals of lectronics" which has been studied by any blind persons.

In a related area, advanced arthritics, olio victims and bed-ridden persons of l categories are also brought much easure through tape correspondence.

More Advanced Techniques: Programs eard on television or radio can be reorded by placing the microphone close the speaker of the set. Such recordgs may also be made through direct lectrical connections which eliminate xtraneous sounds which a microphone ight pick up.

With a little skill acquired in assemblg several small reels of tape on a rger reel, one can compile a personal pe-recorded scrap book of favourite dio or television programs, family lks, historical events heard over the r, symphonies, dance programs and e material for further enjoyment.

Amateur movie makers find their ms will be more entertaining to views if, as they are projected, there is recorder near the screen playing apropriate soft music with explanatory emarks. Often an almost professional esult is achieved which may compare vourably with commercially produced lms. Where the film maker's corresondents are also film fans, an exchange f films, with accompanying tapes, is great fun."

One who plays a musical instrument, hether interested in classical or popur music, can, through his recorder, ay in his living-room to the accompament of an orchestra. There are availble records consisting only of the orchstral accompaniment of famous conert pieces, well known songs and popular music, as well as piano accompaniments on tape of such music.

(Sources include: Music Minus One, 719 Tenth Avenue, New York 10019, N.Y.; C. and B. Library, Selma Avenue, Hollywood 28, California; Accompaniments Unlimited, Inc., Grosse Pointe Woods, Michigan; piano accompaniments on tape—over 3,000.)

One need only transfer accompaniments on records to tape and he can then play along and be the soloist over and over again. Students can replay passages which present difficulty. There are similar records of string quartets, quintets, trios and duets where the music of one part is missing and is supplied, upon purchase. Records of popular music, with the saxophone or another instrument missing are also available.

An Ideal Hobby: Here then is tape recording and corresponding—an ideal hobby. By this means one may enlarge the number of his correspondents, make new friends and hear unusual accents which bring the atmosphere of a foreign country into his home. In time, he may meet one or more of those with whom he talks and have the pleasure of hearing a voice, long familiar on tape, come from the lips of a tape friend, in his presence.

Mr Harry Jay, president of the Recording Society of Australia, sends us this picture, taken in his recording "den." Equipment includes four tape recorders, turntable, microphones, monitor loudspeakers, cable kit and various mixers and preamplifiers. He is able to record and play back quartertrack and half track tapes at any speed mono or stereo.

ADDRESSES:

Author of this article is Mr Edward Roesken, P.O. Box 187, Palmer Lake, Colorado, U.S.A.

Pictured above is Mr Harry Jay, APSA AIVP, 5 Iona Street, Black Rock, Melbourne S9, Victoria.

We also have to hand a brochure giving details of the Stereo International Magnetic Tape Club, which may be obtained from Box 2593W, G.P.O., Melbourne, Vic. The brochure sets out aims, rules, fees, services, activities, etc. ◘

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KNOW YOUR GRAMOPHONE*

A plain man's guide to records and reproducers

By JOHN BORWICK, B.Sc.

PART THREE—TURNTABLES

We use the word turntable loosely to imply the whole mechanism for rotating a gramophone record, including the turntable proper—i.e., the flat circular plate on which the record is placed, the spindle, driving components and electrical motor.

A turntable's job is easily defined: it must rotate the record at the chosen speed and be as free as possible from long term and short term speed variations which would obviously produce undesirable fluctuations in the musical pitch.

Other requirements include silent running and the absence of warp or up and down movement.

Ancillary functions include the ability to switch from one of the standard gramophone speeds to another (78, 45, 33-1/3 or 16-2/3 r.p.m.), with perhaps a fine speed adjustment, an optical means of checking the running speed, and in some cases the complex mechanical "programming" associated with auto-changers for playing a number of records.

The turntable: The best turntable plates are a full 12 inches in diameter, to support the whole area of the records, and are relatively heavy, to contribute a useful flywheel action and so reduce speed variations. However, large heavy turntables need powerful motors to drive them and so they are found only on the more expensive transcription units.

Typical turntable weights are about 8lb for the transcription type and about half this for the domestic auto-changer type.

Various materials have been used successfully for turntables, the principal requirements being strength, rigidity, high density, absolutely uniform density (since it is important that the plate should be completely balanced about the centre spindle) and smoothness (since the drive is often applied by means of a rubber-tyred wheel pressing against the turntable rim).

Cast aluminium possess these qualities and is often used, with sheet aluminium for lighter types.

Cast and sheet steel too are common, though steel naturally introduces the problem of magnetic attraction when a magnetic type of pickup cartridge is to be used. No such problem arises with the ubiquitous crystal and ceramic cartridges but, in the early days of high quality magnetic pickups with low playing weights, the magnetic pull was a serious problem.

A constant pull could be overcome by additional counterweight balancing but, in fact, the degree of attraction varies as the pickup tracks across the turntable, especially if it has solid spokes or perforations, and any up and down motion, as with a slightly warped disc, introduces annoying complications.

As usual, everyone concerned has now taken evasive action: transcription turntables with non-magnetic turntables are becoming the rule and the many makers of magnetic pickups are now advertising the fact that they have eliminated the problem by means of mu-metal screens and special forms of construction.

It is most important that the centre spindle is a flush fit at the true centre of the turntable. This is ensured by dynamic balancing; that is the turntable is fitted on a spindle at the factory and rotated so that any unbalance detected can be corrected by removing small pockets of metal from the turntable itself: an analogy is the dynamic balancing of car wheels.

It is even important that the rubber mat is accurately centred, or else wow could result. The other point to wa about mats is that they can harbour d or sharp particles. Keep them cle is the best advice and this is fairly ea done with a cloth—particularly if the r has widely spaced concentric circ rather than radial, close grained rid

Anti-static mats are becoming po lar, and are based on the principle t placing the record on a mat which i good conductor or at least "diffuser" electricity will help to remove the cord's charge of static electricity (acq ed during the act of removing it fr its sleeve, for example) and so make less prone to attract dust particles fr the atmosphere. These mats are wo considering if you regularly play reco "with the lid off."

Various types of bearing are used the centre spindle: a radiused bottom s face resting on a single ball bearing popular. Oil impregnated bearings run for years without extra lubricati

Types of motor: All the electri motors run from AC mains produce rotating magnetic field, associated w the stationary part (stator), causing rotor to revolve continually as long the voltage is applied.

In some cases a split phase system used; that is, out-of-phase voltages applied to several poles so that the ro is made to chase round in its atten to line itself up with the magnetic fi at any instant. In another type a shad pole is used; that is a copper ring car ing out-of-phase current is embedded one side of the pole so producing required rotating magnetic field.

As the speed of the changing phase related to the frequency of the ma supply, the motor speed is also rela to the mains frequency. For examp a motor with one pair of shaded po

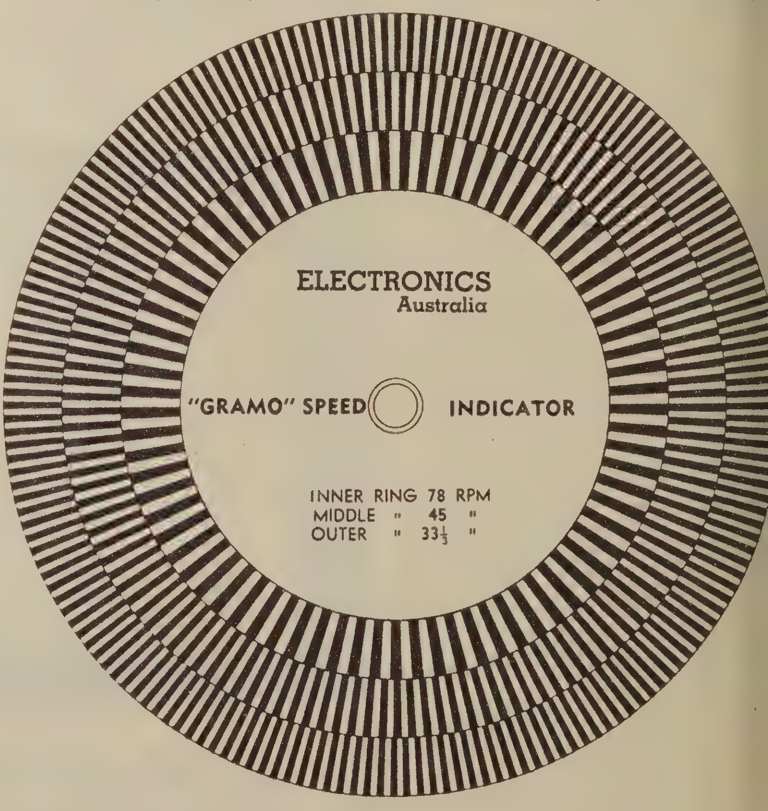

Figure 2: A 3-speed stroboscope, which may be cut out and pasted on cardboard.

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* *Reproduced by arrangement with "Gramophone" magazine.*

rdinary poles per phase is constrained erform 3,000 revolutions per minute 0Hz mains (and would run at 3,600 on 60Hz mains — e.g. in North erica).

the so-called synchronous motors, rotor is actually a permanent mag- and, if it is spun up to synchronous d, it will maintain this speed fairly rately. Synchronous motors are efore popular in fixed speed applica- s and are used in many tape re- ders and gramophones.

he induction type, on the other hand, an electromagnet rotor and its run- speed (typically 1,320 rpm) de- ds on the current induced. Though ever quite reaches the synchronous d, an induction motor has the ad- tage that a speed control can be in- luced, for example, by simply fitting variable resistor in the feed to the or coil.

nother method is generally used to fine speed adjustment on transcrip- turntables, based on what is called eddy current brake. As figure 1 ws, this consists of an aluminium on the motor shaft and a small shaped permanent magnet. At all es, as the disc rotates, it is cutting ough the field of the magnet and hav- eddy currents induced in it. The posing torque so produced on the disc refore acts as a magnetic drag or ke on the motor and this can be ied by causing the magnet to overlap re or less of the disc surface.

The usual range of speed control pro. led is of the order of ±2½ per cent of minal, which corresponds to just under semitone overall.

Stroboscopes: On turntables which ssess a speed control, it becomes im- rtant to provide a means of quickly ecking by eye that the nominal speed being maintained. Even on synchron- s turntables, and others with fixed eeds, it is reassuring to be able to eck that the speed is correct.

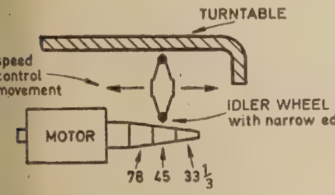

Figure 3: Horizontal drive arrangement with tapered motor shaft along which the idler wheel can be traversed to give continuously variable speed control. Click stop position can be included for the standard speeds.

This is the job of a stroboscope and oboscopes range from a simple printed rdboard or plastic disc (see figure 2) elaborate built-in neon lamp and hed turntable systems. Some people en make their own stroboscopes and, case you are that way inclined, you ed to make 180, 133 and 77 equi- stant black blobs for the three speeds -1/3, 45 and 78 rpm respectively. countries with 60Hz AC mains the obe segment numbers are 216, 160 d 92.)

How are these magic numbers arrived ? Well, all stroboscopes work on the inciple of persistence of vision and the ct that any form of illumination from an AC mains supply is not steady but pulsating.

On 50Hz mains, the light is glowing brightly 100 times per second. Therefore, if the lines or dots on our stroboscope device have just moved forward one place in one-hundredth of a second, they will appear to form a stationary pattern. Any deviation above or below this speed will give the effect of a forward or backward drift of the pattern.

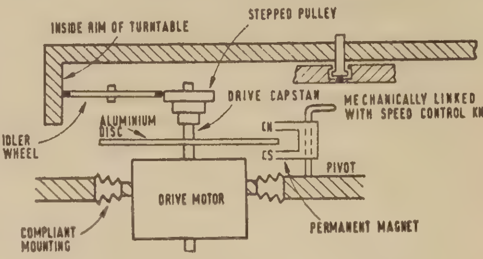

Figure 1: Showing how speed reduction gearing and insulation from motor vibrations is achieved by the use of an idler wheel between the capstan and the turntable. Also illustrated (lower right) is an eddy current brake speed controller.

For the correct speed, our strobe marks must be replacing each other 100 times per second, or 6,000 times per minute. Therefore, the number of marks is found by dividing the required rpm speed into 6,000. Readers with a mathematical bent will see that the 33-1/3 rpm speed does give an accurate whole number of 180 as stated above. The 45 and 78 speeds, however, are inexact and have to be taken to the nearest whole number.

When the stroboscope pattern is stationary for these speeds, the actual turntable rate is 45.112 and 77.92 rpm respectively. Similarly on 60Hz mains systems, while the 33-1/3 and 45 strobes are exact, the 78 rpm speed is actually 78.26 rpm.

Types of drive: In discussing motors, a typical speed of 1.320 rpm was mentioned. There must therefore be a speed reduction mechanism between the motor drive spindle and the turntable itself. It is also vitally important to isolate the tuntable from the motor vibrations and so the reduction is normally transmitted by means of rubber idler wheels or belt drives, and the motor is suspended on springs or rubber mountings.

The enemy here is termed rumble and consists of a very low frequency signal passed on mechanically from the turntable to the pickup itself.

Figure 1 illustrates the typical stepped pulley arrangement and it will be seen that the nominal speed is changed by raising or lowering the bearing of the idler wheel so that it engages different diameters on the stepped pulley.

On some turntables, notably the Goldring-Lenco transcription type, continuously variable speed drive is given by substituting for the stepped pulley a conical pulley (see figure 3). It is then usual to provide calibration marks for quick location of the standard speeds (which will normally only be departed from to tune the gramophone record reproduction to the pitch of one's own piano or ears).

Wow and flutter: Short-term speed fluctuations are an inevitable feature of the mechanisms of gramophones, tape recorders, etc., and are referred to by the semi-descriptive terms wow and flutter. When the speed varies at a repetition rate of about ten times per second or slower, it is called wow and could be caused, for example, by lack of balance in the turntable or a "swinging disc"—in which the hole is off centre.

Faster fluctuations are called flutter and are associated with worn idler wheels, motor faults and the like.

These speed variations produce an up and down swing in the frequency of all recorded sounds and are measured by reference to the percentage deviation about the mean frequency. The ear is

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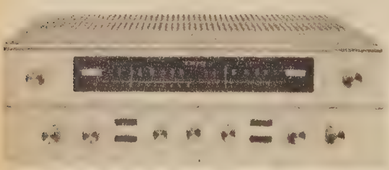

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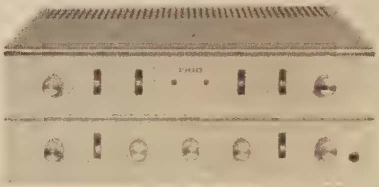

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● OUTPUT POWER: 80 watts total music power (IHF Standard) or 40 watts per channel. 32 watts RMS power per channel. ● DAMPING FACTOR: 20. ● FREQUENCY RESPONSE: 20-50,000 cps ± 1 db. ● SWITCHES: Input selector, Mode selector, Low Filter, High Filter, Loudness, Speakers and Phones, Phase, Tape Monitor. ● DIMENSIONS: Width 15¼″, Height 5¾″, Depth 12¼″.

SOLID STATE AUTOMATIC FM STEREO MU TIPLEX TUNER Model TK-500E
● FREQUENCY RANGE: 88 — 108Mc. ● SEN SITIVITY: 0.8 microvolts (20 db quieting wit 72 ohm antenna). 1.9 microvolts (IHFM stand ard). ● FM STEREO SEPARATION: Bette than 35 db at 400 cps ● SPECIAL CIRCUI Automatic Electrical switching adapter, Inte station Muting, Automatic Mono-Stereo i dicater. MPX Filter, Law Output impedanc Stereo MONO and Tape output. ● DIMEN SIONS: Width 15¼″, Depth 12¼″, Height 5¾

Manufactured By **TRIO CORPORATION** 6-5, 1-chome, Shibuya, Shibuya-ku, Tokyo, Japan ticularly sensitive in the region of)0 Hz and so this frequency is gen- ly used for measurements.

s an example, if a constant tone of)0 Hz has been recorded and the roduced signal contains frequencies ging from 2,950Hz to 3,050Hz, the ng would be

$$\frac{3,050 - 2,950}{3,000} \times 100 = 3.3\%$$

n practice, the values met are much er than this, with transcription turn- les having figures around 0.2 per cent domestic turntables 0.4 per cent. The ies in specifications are usually the so- ed RMS (root mean square) figures ch are 2.8 times less than the peak- eak figure (strictly speaking for sine ve modulation).

The ear's ability to detect wow and ter varies with the individual and is atest for repetition rates around five second. This is also about the rato frequency in singing and play- string instruments, therefore a more ere test of speed consistency is a ording of sustained notes from piano, an or some woodwind instruments.

G. Slot has compiled an interesting le of the estimated permissible wow res for the most critical listeners (see ble 1) and gives peak-to-peak and MS values.

Installing a turntable: Enough points ve been made in the foregoing to ablish the need for care and cleanli- s in handling a gramophone turn- le if its optimum standard of per- mance is to be maintained. Dirt is principal enemy and so are oil and ase which must never be allowed to nain on rubber idler wheels or turn- le rims.

The operating notes for many turn- les contain a reference to the need to turn the speed selector knob to a st" position. This is to prevent the er wheel being left in stationary con- t with the drive capstan for long riod, which could cause a permanent nt or "flat" to be left in the rubber rface and introduce flutter.

The correct procedure for installing a ntable is usually supplied in detail the manufacturer. A stout motor ard should be used of ½-inch plywood thicker, and the necessary holes cut t as outlined on the maker's tem- ate. For most situations it will be st to bolt the turntable baseplate mly to the board, relying on the sulated mounting of the motor to keep s most serious source of vibrations to minimum.

Sometimes, however, the type of oring in the room or the unavoidable oximity of the loudspeaker may cause direct transmission of unwanted rations from board to turntable. A gree of "floating" insulation may then desirable and a set of coil springs is nerally supplied with the turntable for s purpose.

The compliance of this spring mount- is directly analogous to capacitance a filter circuit and tunes with the al suspended mass. To broaden the ing, it is convenient to fill up the ing centre with loose wads of cotton ol or foam rubber.

The turntable should be dead level, d a spirit level can be used to check s at the time of installation. Small irit levels are available for keeping the motor board as a continued re- surance.

Finally, remember that most turntables are sent out with transit screws in position which prevent the relatively heavy motor from jogging about on its flexible mounting. On installation you must remember to loosen off these transit screws and check that the motor is hanging vertically and freely on its rubber grommets or springs.

Allow a few minutes running to warm up the motor and bearing lubricants before checking the speed with a stroboscope — and have a record playing with pickup (and Dust Bug, if used) at the middle of the record for most precise speed setting.

Table I. Permissible wow: most critical listeners.

	Peak-to-peak %	"RMS" %
Piano	0.6	0.22
Oboe/Horn	0.7	0.25
Violin	0.8	0.3
'Cello	0.8	0.3
Symphony Orchestra	0.8	0.3
Dance band with piano	0.8	0.3
Singing (solo)	0.9	0.32
Harp	0.9	0.32
Singing (choir)	1.0	0.36
Brass instruments	1.0	0.36
Dance band without piano	1.0	0.36
Choir	1.2	0.45
Jazz	1.5	0.56

(Reproduced with due acknowledgement from "Audio Quality" by G. Slot, pub. Philips Paperbacks.)

Postscript on autochangers: Enthusiasts in the pursuit of high quality sound reproduction are sometimes accused of taking too "high falutin" an attitude in eschewing automatic changer turntables. But the truth is that, however useful they are in some circumstances, auto-changers just do not go with high fidelity. The reasons are numerous, some of the most obvious being:

1. The dropping and possible scraping of record on record.

2. The changing playing height as records accumulate on the turntable.

3. The changing side pressure as the arm begins to actuate the auto-stop or change mechanism.

However, there is no doubt that some of the newer autochanger designs come near to eliminating some of the above snags. A neat dodge on some models replaces the old support arms with a special spindle in which a finger lever retracts so as to allow one record to drop at a time.

This system means there are fewer objects against which you might accidentally knock the records during loading, and it is also usually arranged that substituting a plain spindle converts the turntable to a single manual player if this is preferred.

Next month we shall take a look at pickup cartridges. ▬

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A REVIEW WITH A DIFFERENCE, MORE MEANING AND NO FIGURES

This is what Larry Zide, Associate Editor of "AUDIO" (U.S.A.) and one of America's leading audio equipment critics says in the May 1966 issue of the popular "AMERICAN RECORD GUIDE" (U.S.A.).

ADC-10E Cartridge

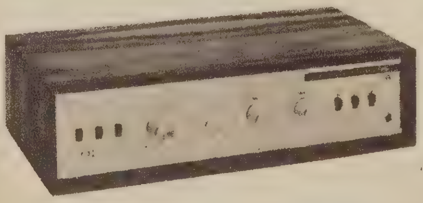
"I am not going to bore you with the usual set of cartridge specifications apropos of the new ADC-10E. My reason for this is, that all of the new crop of cartridges seem to measure pretty much alike. They all have very high compliance, wide bandwidth and low distortion. So where, you are entitled to ask, are the differences?

Let me assure you, that there are indeed differences. The top cartridges may measure alike, but they do not SOUND alike. No, sir!

I might agree, that the differences are not great, but at least they are such that I find some cartridges I can listen to and some I cannot. Furthermore, while some of the former are merely good, there are only a precious few, I feel, are extracting close to all that the record groove can yield.

This ADC belongs to that quite exclusive latter group. I have done a lot of listening to it. It is certainly smooth and wide range. But unlike many others, the ADC-10E is NOT strident in the high registers. It sails easily through the most difficult-to-handle recorded passages.

I have used this cartridge for stereo and mono discs. Its elliptical stylus is not the best for some of the earlier LPs, but then there is no universal size or shape. Certainly, the ellipsoidal shape is most suitable for modern stereo discs. If that is what you play, then you should try this ADC. I EXPECT, THAT IT WILL BE AMONG THOSE WITH WHICH I PLAY *MY* RECORDS FOR QUITE A WHILE TO COME."



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Classical reviews

By JULIAN RUSSELL

rtok Concerto . . . “superbly played”

RTOK—Concerto for Orchestra. Dance Suite. London Symphony Orchestra conducted by Georg Solti. Decca Stereo SXL6212.

RTOK—Concerto for Orchestra.

ACEK—Sinfonietta. Cleveland Orchestra conducted by George Szell. CBS Stereo SBR235153.

ere are two performances of the
certo for Orchestra superbly played
magnificently recorded. Both are so
d that your preference for one in-
d of the other will be intensely per-
al, and you will probably be influenc-
in your decision by the different
plings. The London Symphony and
Cleveland are way up among the
ld's few greatest orchestras. The
veland is famous for its almost un-
ny precision, the London Symphony
its unique elan. The Cleveland's pre-
on is the result of 25 years' work
ler Szell's martinet-like discipline. And
night be indicative of the tempera-
ntal differences between the Cleve-
d and the London Symphony that the
er did not get along very well with
ll on the few occasions on which he
ducted them. I hasten to add that this
ot meant to disparage either Szell or
London Sympony.

artok, was, of course, Hungarian
so is Solti. Szell had a Hungarian
er and Czech mother and was born
Budapest. Both have won enviable reputations as conductors of a wide range of European music, with Szell perhaps covering a wider range of composers of all styles and nationalities. Bartok wrote his Concerto for Orchestra under commission for the Boston Symphony and gave it its title because of the virtuosity demanded from every department. He would have been happy with the skill and polish displayed by both orchestras in the performances under review here.

Solti is a more extrovert conductor than Szell and, for that reason in the Concerto for Orchestra, I prefer, ever so slightly, his reading. Not that there is anything prim about the Cleveland's performance. It is just that Solti's reading is a few degrees warmer in temperature, his tempos ever so slightly more elastic, and he is not loth to use rubato, though to me always within the bounds of the best of taste, in a manner which I cannot imagine Szell approving wholeheartedly. But having said that I find it difficult to add anything more that might help you in reaching a decision. For the playing of both orchestras is beyond criticism, and the recordings, though one has British and the other American characteristics, are also faultless.

And I do not find my choice of couplings as easy as you might, for as much as I enjoy the Bartok "Dance Suite," Szell offers what is easily the best account of Janacek's "Sinfonietta" that I have ever heard. I am, however, certain of one thing—that I much prefer the Dance Suite to Bartok's "Two Portraits" which Kubelik used as a fill with the Royal Philharmonic in the only version of the Concerto worth mentioning in the same breath as the two noticed here.

The Dance Suite marks an important stage of Bartok's development, indeed he himself considered it his first mature work. It was written in 1923 when the composer was 40 years old. At first hearing, the five sections into which it is divided by a recurring ritornello could be mistaken for folk music in origin. In fact every theme is of Bartok's invention. It is a work which throbs with life in every bar, is eminently assimilable at even first hearing, and a growing joy when, through familiarity, its many ingenuities can be appreciated. It is beautifully played by Solti and his orchestra.

On the other hand, Szell's coupling, the Janacek "Sinfonietta," has long been overdue for re-recording and here receives treatment that makes the long wait seem worthwhile. Szell attacks it in a way that makes its simple orchestral colours glare in the righ places, though he successfully subdues them in the pseudo pious third movement. Not nearly enough of Janeck's music is available in first-class recorded form in western Europe. His great operas, "Jenufa," "Katya Kabanova" and the "Makropolous Case" were put out with indifferent sound many years ago by Supraphon and have not since been remade. "The Cunning Little Vixen" fared better, but this light, allegorical work gives the stranger to Janacek little idea of the dramatic sweep in his great human music dramas.

Orchestrally he is even worse off. True there have been other recordings of the "Sinfonietta" worthy of consideration, but never one as good as Szell's. Janacek's style is highly individual. It consists of short phrases inexorably repeated like the remarks of an obstinate, laconic man. His melodic line is based, for the most part, on the speech inflections of his native Moravia. It is like no other music that has been written before and seems doomed to have no "developers." But every bar is wonderfully vital, and Janacek communicates his message without misunderstanding though his tongue is completely alien.

Not many collectors would be prepared to invest in two versions of the Concerto in order to enjoy their unquestionably attractive fills. The only course I can recommend is to choose the Concerto you prefer and hope for some other coupling to turn up in the near future which uses the secondary item you have missed this time.

aphnis and Chloe . . . *“best available”*

VEL—Daphnis and Chloe. Complete Ballet. Orchestra of the Swiss Romande and the Chorus of the Radio Romande (Lausanne) conducted by Ernest Ansermet. Decca Stereo SXL6204.

t would be fair to say that Ravel was
entially a miniaturist. Most of his
npositions are short: even his essay
sonata form for piano is a sonatina.
two operas, "L'Heurs Espagnole"
"L'Enfant et les Sortileges," are
ty trifles, elegant but weightless.
aphnis and Chloe" is his only really
ge-scale work. Ravel himself called
a "Symphonie Choreographique." It
nassive in structure, beautiful in form,
a striking example of musical sym-
try. After having completed it Ravel
e again relapsed into miniaturism.

This is the fifth complete "Daphnis
Chloe" to appear in the English
. Catalogue, and the second to be
de by Ansermet and the Swiss Ro-
nde. His previous recording of the
rk appeared back in 1953 before the
vent of stereo. The new Ansermet is
best now available, despite stiff
mpetition. It is recorded with the
solute clarity that displays all the
stalline beauty of Ravel's scoring, and
playing of the Swiss Romande is sensitively idomatic, exquisitely accurate, and where necessary, excitingly dramatic.

Those who know "Daphnis and Chloe" only from the suite usually played at concerts, without the chorus, can have no idea of the magnitude of the work. Ansermet plays the complete score with the atmospheric chorus added to the orchestra. And he profits by the many years he spent as chief conductor for the great Diaghileff Ballet Company by making it all sound as it should—ballet music, its chief purpose to provide music for dancing. This is a gift Assermet shares with the late Pierre Monteux, another Diaghileff conductor, who officiated at the famous riot that greeted the first performance of Stravinsky's "Sacre du Printemps."

Although it is a fine orchestra, the Swiss Romande is not among the world's greatest, but the players know this score so well that even the many solo passages, mostly for woodwind, are played in a way it would be difficult to improve on. To me "Daphnis and Chloe" is one of the greatest and most enjoyable works to come out of the French school, of any period, certainly of this century. Here you have it in a lovely performance, superbly engineered.

* * *

ELGAR—Concerto for Cello and Orchestra. Jacqueline du Pre with the London Symphony Orchestra conducted by Sir John Barbirolli.

Sea Pictures. Janet Baker (contralto) with the London Symphony Orchestra conducted by Sir John Barbirolli. HMV Stereo OASD655.

By a very strange coincidence two great fledging musicians have acquired fame in performances of Elgar's only two Concertos. Back in 1932 when Yehudi Menuhin was a youth of 17, he played the Violin Concerto and was such a resounding success that the composer himself was delighted to record the work with the boy. Then 30 years later, a

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ar-old cellist, Jacqueline du Pre, so resplendently in the solo part cello concerto that her name has ie inseparable from it.

w Sir John Barbirolli himself no cellist, has recorded the concerto Miss du Pre and the London Sym- Orchestra in a performance that ce reveals the reason for the extraary enthusiasm with which her ng of the work was received in

ar is not very popular outside h countries. Back in pre-World I days Richard Strauss' enthusiastic acy of his music, particularly the ma" Variations, won Elgar tem-y attention in Germany, but else- his music was seldom heard. Even foreign cellists usually include it eir repertoires for performance be- British audiences only. And dur-he past 20 years most of Elgar's has been neglected, if not entirely itish concert halls, at any rate by h recording companies. However, state of affairs seems to be a thing e past and Elgar is once again, after customary lapse in popularity that ws a composer's death, to be heard live and on disc. And, by the way, enthusiasm with which Sargent's ey Town Hall performance of the A Symphony was received some three ur years ago should encourage the ralian Broadcasting Commission to is hear more Elgar at their sym-y concerts.

me, the Cello Concerto is not only of Elgar's finest works — it came late in his career—it is also one ne best ever written for the instru-. And I found his record a source xquisite pleasure from beginning to It is obvious from her very first that Miss du Pre is completely cated to the work. Technically it s no problems that have not been d without any evidence of effort he young player's part. So much at the actual notes in the difficult seem not to worry her in the test degree, and throughout she tains tonal beauty unrivalled among cellists of her age.

e phrases as naturally as she hes. There is never a niggling bar an over-emphasised one. And her all reading is romantically big, in very best meaning of the term. It ifficult to imagine a better choice conductor than Barbirolli. He is nce not only a great lover and ad- of Elgar, but, as was mentioned e, a fine cellist himself. And his ling of the London Symphony in grand recording offers all that a per- collaboration should do. The en-ering, too, is absolutely first rate.

en in England, Elgar has never been y regarded as a song writer. Except e realm of oratorio his vocal writ- have been largely neglected. The Pictures" recorded on the reverse of the concerto had a brief vogue dwardian days but are seldom heard adays. Perhaps the commonplace ty of the texts might offer an ex-ation, because the songs themselves ain some lovely melodies. And in the rding under notice Janet Baker sings so beautifully that even the textual nonplaces can be comfortably ed.

iss Baker's tone is always attractive readings imbued with fine musical igence. Now and again I felt she a phrase a shade too slowly, though without serious damage to the progress of the music. And Barbirolli is again there with the same great orchestra to add the colourful accompaniments. A disc no lover of Elgar will want to miss, and the success of which might encourage the recording companies to let us have more of the same composer.

* * *

WOLF—Morike Lieder.

PFITZNER—Eichendorff Lieder. Hermann Prey (baritone) and Gerald Moore (piano). Decca Stereo SXL6207.

This is an uneven recital, especially in the Wolf songs, many of which I found disappointing. This despite generally good tone and correct phrasing What Prey lacks here, somewhat surprisingly when his previous recordings are recalled, is identification with the composer's characterisations and swift changes of mood—two essential features in the performance of Wolf's lieder.

Sentimentality is no substitute for a young man's unrequited love about which Wolf was writing in "The Gardener." Nor does Prey ever convince one of the force of his passion in "Insatiable Love." His "Tramping" suggests something more in the manner of a quiet stroll, and "On My Wanderings" fails to express the ecstasy that lies so close to its surface. In fact, in all these Wolf items I enjoyed the inimitable accompaniments of Gerald Moore more than I did the singing of his principal.

On the credit side must be recorded Prey's deftly light touch in "Commission," and his eloquently moving performance of "Homesickness." "The Prayer" and "The Drummer" also rank high in the art of lieder singing at its best. Prey is excellent, too, in the Pfitzner songs, now seldom heard, despite the vogue enjoyed by the composer in Germany and Austria some 30 years ago. All the songs are pleasing, if little more. The texts, in English and German, accompany the disc.

* * *

BELLINI—Norma: "Casta Diva." Il Pirata: "Col Sorriso d'Innocenza."

DONIZETTI—Roberto Devereux: "Vivi, Ingrato." Lucrezia Borgia: "Com'e Bello." Maria di Rohan: "Havvi un Dio."

Montserrat Caballe (soprano) with Orchestra and Chorus conducted by Carlo Felice Cillario. RCA Stereo LSC2862.

When I reviewed this record in my weekly column in "The Sun," I wrote: "Montserrat Caballe . . . has the most exciting voice I have heard for many a long day." On playing it again I can think of no reason for changing my opinion. Madame Caballe has all the virtues one expects to find in a great soprano—purity of tone, evenness throughout her wide range, accuracy of pitch, and control so assured that, when she goes after a top note, there is never a moment's doubt that she will hit it right in the middle and without any seeming effort, whether it is delivered with hall-filling volume or just whispered.

Since her recital here is confined to music by Bellini and Donizetti coloratura plays an important part, and these florid passages, too, she delivers just as smoothly as her long legato cantabile phrases. In short, her voice is so spectacularly beautiful and so perfectly produced that one can only wonder why this is her first recording. And the mystery deepens when one learns from the record sleeve that she has been Spain's leading soprano for many years, and has also appeared at La Scala, Vienna and Paris Opera Houses and at the Glyndebourne Festival. The sleeve notes also state that she has a repertoire of more than 40 operatic roles, and on the concert platform sings the music of Mozart, Richard Strauss, Falla—this without surprise since she is Spanish—but very surprisingly, the 12-tone composer Luigi Nono.

Her two most formidable rivals today are, of course, Callas and Sutherland, and comparison with them is—and I imagine will continue to be—inevitable. But I can state at once that listening to Caballe never involves one in the anxiety of awaiting a screeched top note, as in the case of Callas, nor in disappointment in the slurred diction and tendency to moo that so often mars otherwise fine performances by Sutherland. Her singing of all the pieces in this, her first recorded recital, gave me unqualified pleasure from beginning to end. There was not one bar that disappointed me. And I learned recently from RCA that more recitals by her are to be issued.

She is admirably accompanied throughout by an anonymous but excellent orchestra conducted by Carlo Felice Cillario, a name as new to me as Madame Caballe's. Recommended with the greatest enthusiasm.

* * *

SCHUMANN — Fantasia in C Major, Op. 17. Etudes Symphoniques, Op. 13. Vladimir Ashkenazy (piano). Decca Stereo SXL6214.

SCHUMANN — Fantasia in C Major, Op. 17.

BEETHOVEN — Sonata in D Minor (Tempest), Op. 31, No. 2. Sviatislav Richeter (piano). World Record Stereo T4075.

Here are two fine performances of the Schumann "Fantasia" and your preference will again probably be influenced by couplings and, perhaps, the lower price of the Richter. The "Fantasia," though perhaps Schumann's most important work for the piano, is awkward to play, by which I mean its technical difficulties are not the usual ones but include unusual placing of the hands and fingers. Both these fine pianists, however, deliver it with faultless accuracy, and both approach it ready to serve Schumann's romanticism with the generosity and impulsiveness it needs.

Frankly, my preference oscillates from one to the other, in favour of a few bars here and there in both. When I listen to Richter's murmured accompaniments supporting a beautiful singing melody I am, temporarily, at least, all for him. Then I listen to the brilliance of Ashkenazy's coda to the middle movement and veer off in his direction. Both pianists can be truthfully described as poetic, both have all technical problems securely solved, and both offer phrasing of great beauty.

On his disc Ashkenazy plays more Schumann—the "Symphonic Studies." And you have it here in a form I cannot recall having heard before on any other recording. For Schumann wrote five extra studies in addition to the original 12, which are seldom played in the concert hall and, as I have just written, just as seldom recorded. These five studies were discovered by Brahms, who published them—he was, of course, a devoted admirer of Schumann's widow, Clara—and used to include them in the same place as Ashkenazy now plays

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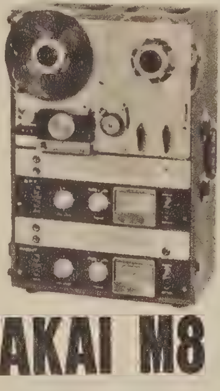

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them—between the original ninth a
10th studies. As a result, the scope
the work as a whole is much expanc
and the climactic final study is mu
better approached.

During his recent Australian tour
fred Brendel omitted these five stud
and though he played the remaining o
with great elan I still find myself enj
ing Ashkenazy's extroverted readi
more than I did Brendel's more classi
interpretation. If you want an all-Scl
mann recital I have no hesitation
recommending this admirable disc.

On the other hand Richter incluc
such a fine performance of the Be
hoven D Minor Sonata that I wou
find it hard to pass it by. It is a m
vel of transmitted concentration, so tl
while he takes some of the Adagio mu
slower than it is usually played, he dc
so without sacrificing any sense of t
music's continuity, and, moreover, w
a great deal of rubato which, in oth
circumstances, might sound a little ov
done. But certainly not here. And
contrast to the slowness of the Ada
you have the Allegro going like lig
ning, with an effect I can only descri
as electrifying.

Also, despite the fact that the son
must have been deeply considered
Richter before he decided on his rea
ing, there is nothing in his playing
rob his performance of quite wonder
spontaneity. It is an exciting perfor
ance, different yet valid, and under Ric
ter's magic fingers, sounds as fresh tod
as it must have done way back when
was composed. The sound on bo
discs is good, with perhaps the Dec
having a slight edge on the Wo
Record Club's. Since it is unlikely th
any buyer would want to acquire tv
versions of the Fantasia simultaneous
I am sorry I cannot be more helpf
over a most difficult choice. If fac
with the problem myself I might pref
the Richter ever so slightly on t
grounds of the novelty of the Beethov
performance. But against that, of cour
there would be the dilemma of passi
up the complete version of the Sy
phonic Studies which I do not know
in any other contemporary recording.

* * *

STRAVINSKY—The Fairy's Kiss. Co
plete Ballet. Columbia Sympho
Orchestra conducted by Igor Str
vinsky. CBS Stereo SBR235149.

The old Coronet mono that Stravins
made with the Cleveland Orchestra
this charming score has long since be
deleted from Australian catalogu
though my pressing has continued to gi
me so much pleasure that I have oft
played it over the years. This tim
with the Columbia Symphony Orchest
Stravinsky makes only minor changes
his reading, but each one is an improv
ment on the earlier performance.

Nowadays, even at 84 years old, h
syncopations—and the work is full
them — are crisper, his accents mo
pointed, and his wonderfully clean c
chestral colours still more sharply d
fined. The music is, of course, for t
most part based on melodies by Tcha
kowsky, but under Stravinsky's high
individual treatment they far transce
mere arrangements and become as ty
cal of Stravinsky as they were of the
original creator. Despite engineering th
was first rate when the Coronet appea
ed, the new CBS sound is infinite
superior to its predecessor's in eve
material feature.

DOCUMENTARY RECORDS

Reviewed by Ellis Blain

**ROL CHANNING in the original
story "GENTLEMEN PREFER
BLONDES." Caedmon TC 1148
(Mono).**

o most people outside America,
entlemen Prefer Blondes" is Marilyn
nroe and the film she made in 1953
the story of Lorelei began as a series
sketches in "Harper's Bazaar" as long
as 1925; Anita Loos' classic became
est-seller in book form in 1926. By
9, it was a hit musical on Broadway
the star was none other than the
of this 1962 recording, Carol
anning.

arol Channing is one of the great
sonalities of the American musical
atre and was only recently the centre
some controversial electronic experi-
nts directed at assessing audience
ction to television programs in ad-
ıce of full production. But Miss
anning's talents exceeds the confines
a mere musical and her performance
the Cat in "Archy And Mehitabel" is
em among the literature of the spoken
rd on record.

The story of "Gentlemen Prefer
ndes" could be summarised as a
aresque comic characterisation based
the real observations of a wide-eyed
nde who allows only gentlemen of a
tain balance to vie for her favours.
this hilarious revelation of Lorelei's
ventures, the scene is mainly Paris and
episodes mainly wild.

Throughout the entire farcical proceed-
s, however hotly pursued by wolfish
enchmen, panting Englishmen and
ging wives, the heroine nimbly and
bly pursues her own goal—the dia-
nd tiara of her dreams. It is of interest
t James Joyce was so taken with this
nsy plot that even when he was losing
eyesight, he devoted hours to reading
book. In a letter written on Novem-
r 8, 1926, Joyce wrote: "I have been
clining on a sofa reading 'Gentlemen
efer Blondes' for three whole days."
wever, his further critical comments
ve never been published. . . .

This recorded performance includes
out one-third of the original novel,
verly and convincingly edited by
ward Sackler, who directed the pre-
ntation. Vintage hit tunes of the
enties played by Charlie Katz and
s Stonegrove Serenaders add the final
ıch of authenticity.

* * *

**IE POEMS OF JAMES STEPHENS
read by the author. Caedmon 744.**

Arthur Luce Klein who produced this
ord describes his first sight of James
phens at a lecture recital in the
eat Hall of a mid-western university,
e was half sitting, half curled up on
edge of his chair, his hands folded
his lap as if he were waiting for the
n and jam for being a good boy. It
s the first poet I'd ever seen so I took
ong, hard look. He was a slight, deli-
e-looking man with a bit of grey
r that grew thick around the back
his neck and over the top of his
s. He looked as if he were wearing
grey halo that had slipped down. I
ught that he looked as if he might
ve been descended from a leprechaun."

These readings were recorded shortly before Stephens' death in 1950 and capture the vigorous imagination he brings to his dual role of reader and author. They give the impression of complete spontaneity. Truly, a rare performance . . .

* * *

THE PIT AND THE PENDULUM by Edgar Allan Poe read by Alexander Scourby. Caedmon 830.

Of Edgar Allan Poe it has been said by one of America's leading literary critics, Killis Campbell, "Few writers have lived a life so full of struggle and disappointment, and none have lived and died more completely out of sympathy with their time . . . the widest differences have existed as to his place and his achievements. But there are few today who will not readily concede to him a place among the foremost writers of America, whether in prose or in verse, and there are not wanting those who account him one of the two or three writers of indisputable genius that America has produced."

Poe's writing makes superb material for the gramophone record and Alexander Scourby's performance in this most horrific tale is measured and convincing to a masterly degree. Briefly, the story is that the raconteur has just had sentence passed upon him by the Spanish Inquisition and finds himself confined to the dungeons beneath the city to await his fate which slowly and gruesomely reveals itself.

The terror mounts by inescapable degrees until the listener, like the hero, reaches the limits of human endurance and casts in his lot with the wretch, whatever the outcome. It is this final identification that is the mark of Poe's ability to extract from human experience all the mystery, horror and doubt that lie somewhere just beneath the surface ■

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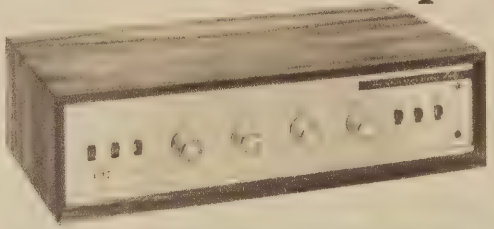

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Tape (RCDR) Input	—78db
Mag. Phono (Standard RIAA)	—55db
Stereo Separation (at 1 kc)	
Phono Magnetic	65db
Tuner	65db
Tape Input	65db
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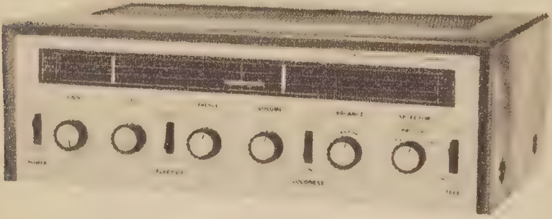

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INPUT SENSITIVITY: Mag. 3mv. tape head 3mv., Aux. 150mv, Tuner 150mv.
EQUALIZER: Mag. RIAA, Tape hd. NARTB.
TONE CONTROL: Bass 50c/s ± 12db. Treble 10kc/s±12db.
LOUDNESS CONTROL: 50c/s + 12db.
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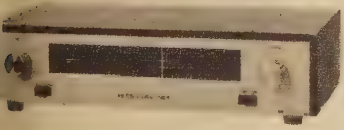

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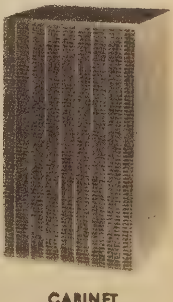

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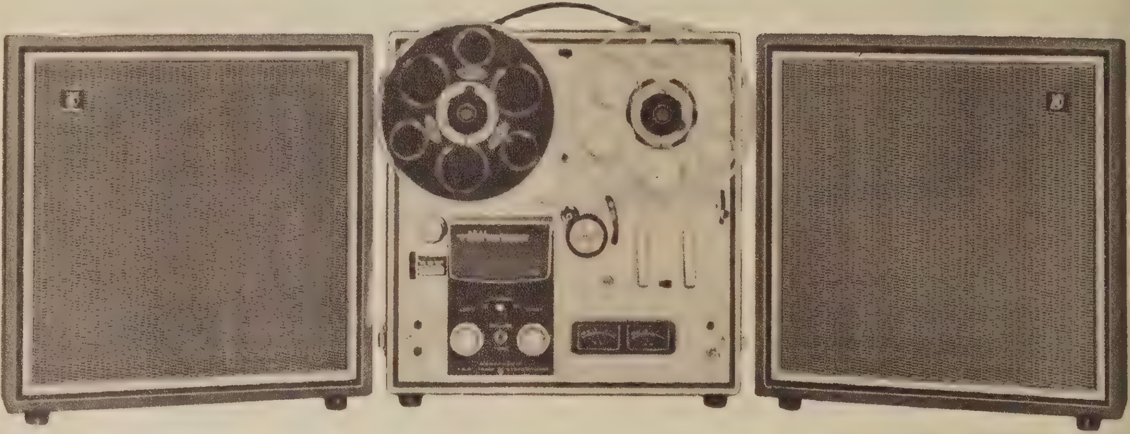

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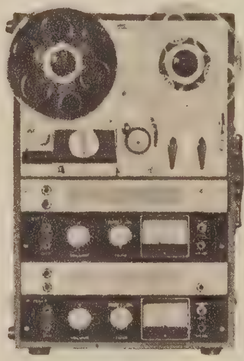

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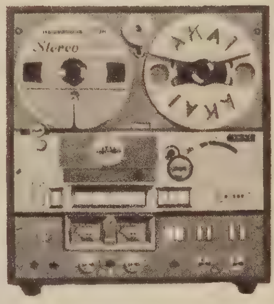

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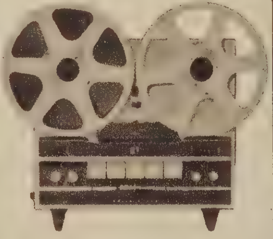

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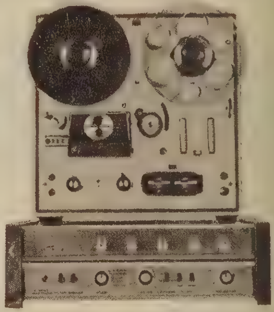

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VARIETY FARE

"ELECTRONICS Australia"
Staff Review Panel

evotional

RSHIP With The Laymen Singers. Directed by Ben W. Allen, with the Paul Mickelson Orchestra. Stereo, Supreme SS2030. Also available in mono SM-1030. (Supreme Productions Ltd., Box 15, Footscray, Vic.)

Interest: Male chorale.
Performance: High standard.
Quality: Mostly good.
Stereo: Well spread.

ponsored by the American Baptist ivention, the Laymen singers is a up of dedicated Gospel singers who ent a weekly program over about radio stations in the United States abroad.

s I have remarked in previous rews, they constitute an extremely nted group, well directed, well discied and well balanced. They are joinon this disc by the Paul Mickelson hestra but I would hesitate to state advantage, at least in those tracks re the brass choir is used. To my , the sound in these tracks is overmatised, over complicated and riding limits of the recording system. On other hand, you may like the brass nd, so favoured on the American spel scene.

he titles: Faith of Our Fathers — iour Like A Shepherd Lead Us — ar To The Heart Of God—Jesu, Joy Man's Desiring — Our God Is A k—The Lord's Prayer—Lo, God Is re—Treasures Of Heaven—Dear d And Father Of Mankind—Halleah, Amen.

ne that will exercise different likes dislikes. I think you should hear it yourselves. (W.N.W.)

* * *

ESS THIS HOUSE. Great Music Of Faith And Inspiration. The Mormon Tabernacle Choir, directed by Richard P. Condie. With Eugene Ormandy and the Philadelphia Orchestra. Stereo, CBS SBR-235,158.

Interest: Esteemed devotional music.
Performance: Superb.
Quality: Good.
Stereo: Excellent.

hatever reservations I might have about the Laymen Singers' album iewed above, I certainly have none ut this one.

his is a large mixed choir, backed occasions by a full symphony orchra and at other times by a large pipe an. But, with the possible exception "Hallelujah Chorus" on the last ck of side 1, the sound is transparent just sufficiently remote for the rich bient of the tabernacle to come ough in the background.

or is there any suggestion of harshs or overstatement.

he music itself is certain to have widest possible appeal: Bless This use (Taylor—Brahe)—Holy Art Thou (Handel)—The Palms (Faure)—The Lord's Prayer (Malotte)—The King Of Glory (Parks)—Hallelujah Chorus (Handel)—Jesu, Joy Of Man's Desiring (J. S. Bach)—Lamb Of God (Dett)—How Lovely Is Thy Dwelling Place (Brahms)—O Lord Most Holy (Franck).

This is a record I can thoroughly recommend. Play it with a little more than the usual bass, a little less than the usual treble. (W.N.W.)

* * *

THE LIVING BIBLE, 4—"Let My People Go." Sir Laurence Olivier reads from the Old Testament. Mono. HMV ALP-1936. Released through the World Record Club.

Interest: Bible readings.
Performance: Compelling.
Quality: Good.

Having just recently reviewed number 11 of this series, some may wonder at this mention of number 4. The explanation is quite simple: The World Record Club is re-issuing the series and new stocks are available of early records in the series.

For those who have not encountered them before, the discs were originally produced by H.M.V. and come in a lavish folder, illustrated with colour plates of mediaeval works of art. It carries the full text, as read most capably by Sir Laurence Olivier. The excerpts are bridged by brief musical stanzas selected by Cyril Ornadel.

"Let My People Go" links together "The Flight from Egypt," "The Ten Commandments," "Jericho" and "The Song of Deborah." Most of it is anecdotal and the reading, for me, had less appeal than the disc reviewed earlier: Number 11, "Comfort Ye My People," based on the writings of Isaiah.

But, of course, the Old Testament is not just Isaiah and this recording deserves as much a place in the complete set as the writings of the esteemed prophet or the poetry of the Psalmist. (W.N.W.)

* * *

LEWISHAM HOSPITAL SISTERS' CHOIR (The Little Company of Mary). Universal Record Club, Mono U-777.

Interest: Catholic liturgy and hymns.
Performance: Unaffected but satisfying.
Quality: Good.

This disc was reviewed in these columns when it was originally released under the Festival label three years ago. As a member of the same faith I should like to add a few comments to those of the original reviewer.

There have been many records made of choirs from famous convents and monasteries noted for their singing, but I personally found the simple, unaffected singing of the sisters on this disc more satisfying emotionally than the more polished performances of the other groups I have heard.

Lay members of the Catholic Church will recognise the Adoremus and the Tantum Ergo from the Benediction service, but the other extracts from the liturgy are not so well known, and are presumably from the office of the order. The hymns are not the familiar and popular ones of the laiety but, as sung by the sisters, they sound very well.

The sound quality is not as good as one would like it to be, no doubt because of the limitations of extra-studio recording. But one does not buy this type of record primarily for sound quality and what one loses in high fidelity is more than compensated by atmosphere in this case.

Adoremus—O Sanctissima—Tantum Ergo—Ave Maria—Regina Coeli Jubila—Haec Dies—Our Lady of Good Counsel—Magnificat and Antiphon—O Gloriosa Virginum—Veni Sponsa Christi. (H.A.T.).

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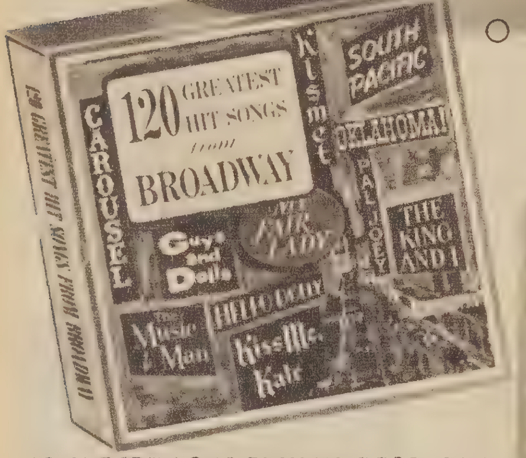

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Instrumental, Vocal & Humour

IE BLUE DANUBE—Johann Strauss. The Vienna Philharmonic Orchestra conducted by Josef Krips. Decca Ace of Diamonds stereo SDDA 133. Also in mono on ADDA 133.

Interest: Strauss waltzes.
Performance: Disciplined but very warm.
Recording: Excellent
Stereo: Wide, smooth.

I think this is about the best recording Strauss waltzes I've heard to date. ips and the Vienna Philharmonic play th great discipline and precision, as e might expect, yet they manage to mbine this with such a warmth and shness that one finds it almost dif- ult to remind oneself that one isn't ck in the 80s at one of those grand ennese balls. Certainly a much rmer performance of Strauss than one ts on many other discs.

The pieces played are "Blue Danube" "Acceleration"—"Emperor"—"Roses om the South"—"Pizzicato Polka."

The recording is of excellent quality, d the stereo is smoothly spread. For rauss lovers, a disc well worth hearing. R.)

★ ★ ★

TER AND THE WOLF, Prokofiev. Narration with full symphony orchestra. Mono, Universal Record Club. UM-680.

Interest: Tale to music.
Performance: Well done.
Quality: Good.

For anyone wishing to introduce their ildren to the symphony orchestra and e sound imagery of music, it is hard imagine a more effective and entranc- g way to do it than through Proko- v's famous "Peter And The Wolf." is a simple tale: Grandfather, a boy, a olf, a cat, a bird and an ill-fated duck. ich has his characteristic instrument iose sound matches the action of the ory.

The jacket does not identify the chestra, the conductor or the narrator it don't let this put you off—the whole esentation is excellent and well up the standard of any of the other eters" I have heard (although this one es take up both sides). If you have ildren or grandchildren of junior age, is one would be well worth adding to ur collection. (W.N.W.)

★ ★ ★

GHT ORCHESTRAL FAVOURITES. The Viennese Promenade Orchestra conducted by Hans Hagen. Festival stereo, SFL-931,843. (Also in mono on FL-31-843.)

Interest: Light classics.
Performance: A little rigid.
Recording: Very good.
Stereo: Smooth, wide.

This disc is a further release in the stival series of light orchestral fav- rites originally recorded on the Swiss lite Special" label. It features Hans agen and the Vienna Promenade chestra playing a dozen more familiar ippets, many of which will be miliar:

"Petersburg Sleighride"—"Serenade"— apanese Lantern Dance"—"Souvenir" "The Glow Worm"—"The Guard rade Of Gnomes"—"Parade Of The ooden Soldiers"—"Poems And Idylle" Serenade from "The Millions Of Harlequin"—"The Skater's Waltz"—"Moonlight On The Alster"—Toselli's "Serenade."

The playing is quite lively, although a little rigid. The recording is of high quality, with bright treble and low noise. The stereo is smoothly spread.

If you like the music, a disc worth hearing. (J.R.)

★ ★ ★

BALLET FOLKLORICO OF MEXICO. Musical co-ordinator Ramon Noble. RCA Records stereo, SL101712.

Interest: Mexican folk music.
Performance: Bright, rhythmic.
Recording: Excellent.
Stereo Quality: Fine.

A disc featuring many of the Mexican folk tunes played by the Ballet Folklorico of Mexico on their recent tour of Australian cities. It makes very exciting listening, with bright and rhythmic tunes, lively playing and warm singing.

The tracks are titled—"The Gods"—"Traditional Tunes Of Michoacan"—"The Revolution"—"Le Huasteca"—"The Tarascans"—"Fiesta In Veracruz"—"Dance Of The Quetzals"—"Wedding In Tehuantepec"—"The Rattlers Of Tuxpan"—"Sugar Harvest In Tamaulipas"—"The Deer Dance"—"Jalisco."

The recording is of excellent quality, and the stereo is used to good effect.

Recommended, especially for those who liked the live performance. (J.R.)

★ ★ ★

ATHENA—The New Sound of Greece. Popular hits of modern Greece, arranged and conducted by Takis Athinaios. Featuring Zoitsa Kouroukli and Thanos Samios. CBS stereo, SBP 233316.

Interest: Modern Greek music.
Performance: Lively, tuneful.
Recording: Excellent.
Stereo quality: Widespread.

A highly enjoyable recording of modern Greek popular tunes and songs, this one. The arrangements are bright and imaginative, the playing warm and the singing fine. Those with the faintest trace of Greek blood in their veins should find it quite irresistable, almost after the first few bars.

The tracks presented are — Zorba's Dance — Horismos — Hathikes — Athina — Never On Sunday — O Kyr' Andonis — Hassapiko Politiko — San Sfiriksis Tris Phopes — Sto Periliali To Krife — Ki' and S' Agapo Den S' Orizo — T'Asteri Tou Veria — Kato Sto Yialo. To those who are as yet unfamiliar with Greek music, Zorba's Dance and Never On Sunday would be good tracks to sample. They're great!

The recording and stereo are excellent. Highly recommended (J.R.).

★ ★ ★

RITUAL FIRE DANCE. The Philadelphia Orchestra conducted by Eugene Ormandy. C.B.S., Stereo SBR 235164.

Interest: Light classics.
Performance: Rousing.
Quality: Excellent.
Stereo: Normal spread.

The common theme to this selection of popular light classics is that they are all associated with the idea of dancing. Some are from classical ballet, some are traditional dance forms, some are stage music for some special dance activity. These are played with great gusto by the famous Philadelphia Orchestra, who are noted for their performance of orchestral fireworks, so that the result is exciting listening indeed.

The de Falla piece from which the disc takes its name is the first track on the second side and one is forced to the conclusion that the title is the result of lack of inspiration. Perhaps this piece is more popular than I give it credit for, but personally I always thought this to be one of de Falla's most uninspired pieces, bordering on the vulgar and quite untypical of the refined style generally found in this composer's works. The rest of the pieces are mostly full of good humour and very lively, typifying the happy atmosphere of the dance in every land.

Tarantella, Cossack Dance and Can-Can from "Boutique Fantasque" (Rossini-Respighi) — Dance Of The Hours (Poncielli) — Hungarian Dance No. 5 (Brahms)—Ritual Fire Dance (de Falla)—Dance Of The Comedians (Smetana)—Dance For Six from "William Tell" (Rossini) — Polka from "Schwanda The Bagpiper" (Weinberger) —Polonaise from "Eugene Onegin" (Tchaikovsky). (H.A.T.)

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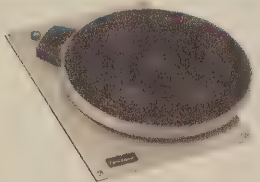

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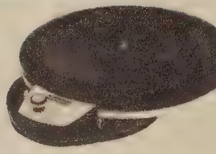

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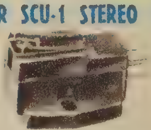

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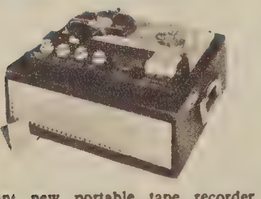
TRUVOX R44 4 TRACK PROFESSIONAL RECORDER



A brilliant new portable tape recorder from TRUVOX. All controls interlock, VU meter gives positive indication of recording level, three speeds (7½, 3¾ and 1 7/8 ips) are incorporated. This easy to use recorder is fully transistorised.

ENCEL PRICE: $135 (£67-10-0)

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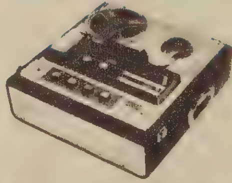
TRUVOX R102 and R104 (2 and 4 track) MONO RECORDERS



Send for reviews . . . they're amazing. Models R102 and R104 both feature solid state circuitry, three heads, three motors and three speeds. Frequency response at 7½ i.p.s. is 30-17,000 c/s plus or minus 2 db. Separate record and playback amplifiers. VU meter.

THE SOLID STATE TSA 100 STEREO AMPLIFIER

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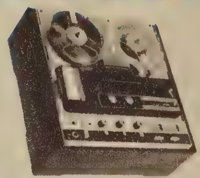
TRUVOX STEREO RECORDERS MODELS PD 102 and PD 104



With four pre-amps, each separate and dependent, complete mono and stereo t monitoring facilities are provided. Twin meters. Mixing buttons for sound-on-sou Separate solid state record and playback am fiers. Sensitivities match any ancillary equ ment of any make. Three motors, th speeds. This most sophisticated stereo corder from the U.K. Write for specificatio Rave reviews on the PD 102-104 are vogue!

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argain-priced Tchaikovsky

TENDER AND TRIUMPHANT. The Beautiful Music of Tchaikovsky. 1812 Overture, Marche Slave, Andante Cantabile. The London Philharmonic Orchestra, conducted by Massimo Freccia. Stereo, Reader's Digest/RCA Dynagroove CM/CSC-308.

Interest: Favourite classics.
Performance: Excellent.
Quality: Excellent.
Stereo: Impressive spread, definition.

In a recent conversation, someone made the remark that no record is cheap unless it is also good — which is probably quite true. Unless a record is played, and enjoyed, its purchase price is wasted.

There's no need for any such reservations about this Tchaikovsky disc, which Reader's Digest are offering for one dollar, no doubt as a clientele builder. It's an excellent performance, it's very well recorded and the stereo is quite outstanding.

The 1812 Overture pulsates with bass that is full and round and even near the end, on the inner grooves of Side 1, with orchestra, church bells and cannon at full bore (!) there is no sound break-up, no obvious tracing distortion.

For those whose knowledge of the music is limited, the tastefully designed jacket carries a portrait and brief biography of the composer, mention of the conductor and notes on the three items.

Value that has surely never been bettered. (W.N.W.)

TASTE OF HONEY and other favourites, played by Living Brass. Arranged and conducted by Ray Martin. RCA Camden stereo, CAS-949 (Also in mono, on CAL-949).

Interest: "Tijuana" sound pops.
Performance: Bright, lively.
Recording: Very good.
Stereo: Well spread.

nother disc exploiting the "Tijuana" "mariachi" sound currently enjoying ularity, this time from Living Brass. h bright, lively arrangements and an edibly insistent beat, it would be ideal dancing and parties — although lly the choice for a quite evening of xation.

he tunes featured are: A Taste Of ney — South Of The Border — silia — Some Enchanted Evening — Cu-Cru-Cu-Cu Paloma—The Third Theme — Life — Happy Pierre — rtaches By The Number — Never Young.

he recording is of high quality and stereo well spread (J.R.).

★ ★ ★

REEN THEME. Latin touch. Los Indios. Festival, Stereo SFL-931, 972. Also available in mono, FL-31972.

Interest: Guitar group playing film themes.
Performance: Relaxed.
Quality: Excellent.
Stereo: Effective.

ne feels that the title of "Los In-," adopted by this Japanese guitar up was chosen more for commercial eptability than for accuracy, since r style is not really characteristic South American music. However, ll other respects this is an enjoyable .

he performers adopt a very leisurely ude toward the music and play in a xed fashion which I personally nd very pleasant. There are no micks in the arrangements—the ody is played by the lead guitarist, harmony from the other members ing the same instruments and thm base provided by the percussist. Sound quality and stereo argement are both quite excellent.

s the title implies, the 12 tracks all ure tunes from films: "Kungsleden," "Thunderball," "La Ragazza di Bube," "To Love Again," "The Third Man Theme," "El Solo un Gioco," "La Playa," Theme from "Jeux Interdits," "Il Ferrouiere," "Unchained Melody," "Summertime In Venice." (H.A.T.).

★ ★ ★

ST. PETER'S CEILI IRISH BAND. Festival, Mono FL-31,949.

Interest: Irish traditional dance music.
Performance: Authentic.
Quality: Good.

A ceili (prounced chaylee) is a social occasion in Ireland and other Gaelic countries where everybody has a good time and dances the traditional jigs, reels, hornpipes, etc. The function of the ceili band is to provide suitable noises for these performances, so that the dancers can "batter the floor" in the tradition of Phil the Fluter.

The St. Peter's Ceili Irish Band does this admirably, with sets of traditional dances arranged in groups of three in the usual manner in Gaelic music, to avoid the monotony of too much repetition of the same tune. However, I feel that this disc is strictly for dancing, as even the most fervent admirer of ceili bands is likely to find 40 minutes of playing a bit overlong just for listening purposes, even when the performers are as skilful as the St. Peter's group.

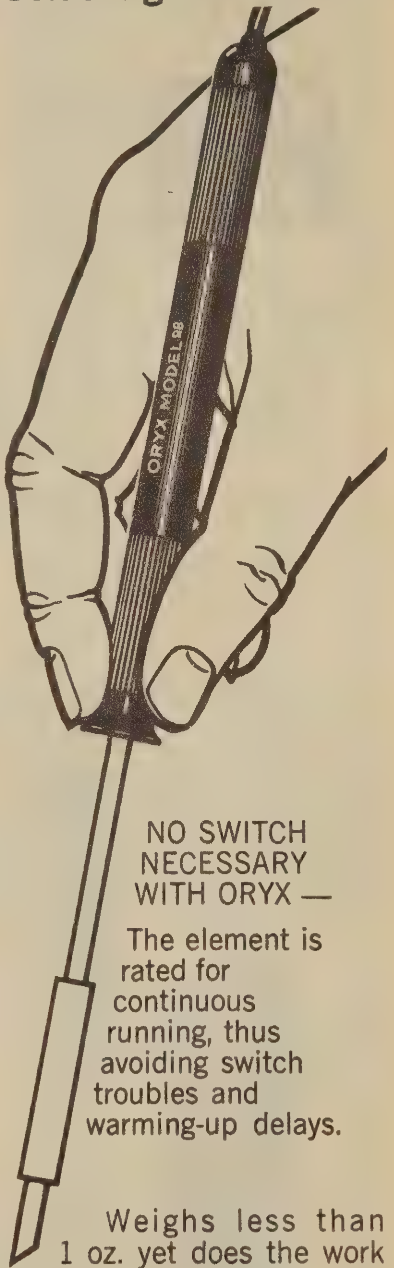
There are 12 selections on the disc, the track titles being: Marches—Jigs Reels—Hornpipes—Marches—Waltz — Reels—Hornpipes—Marches — Jigs — Reels—Hornpipes. Since there are three tunes in each selection, making 36 in all, I must omit these for space reasons. (H.A.T.).

★ ★ ★

GREAT THEMES FROM GREAT EUROPEAN MOVIES. Mr Acker Bilk, clarinet, with The Leon Young String Chorale. Columbia stereo, SCXO-3576. (Also in mono on 330SX-1780).

Interest: Popular clarinet.
Performance: Warm, sensual. . . .
Recording: Excellent.
Stereo: Widely spread.

Some really sensual woodwind sound on this disc of movie themes played by clarinettist Acker Bilk, together with some smooth backing by the Leon



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ured at 8 watts. Decca Deram diamond needle. Ga
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"Audio and Record" — "English Gramophone" Ap
1966: "Well designed . . . superbly polished . . . P
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frequency response." "Audio and Record" Feb., 19
review: "Smooth quality, extended range at both en
of the spectrum with bass and transients particula
good stereo separation, excellent virtual freedom fr
hum. Pick-up recommended."

6 Oki Tape recorders beautifully designed. Superb performance. Exclusive to Recorded Music Salon, for Victoria. Please write for catalogues.

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ung String Chorale. The arrange- nts are warm and bright, and Bilk's ity sound is closely miked to form a tinct pseudo-centre channel. It makes citing and entertaining listening.

The tracks are titled: From Russia ith Love — Non Dimenticar — La nde—Firestar ("To Bed or Not To d")—Autumn in Rome—Never On nday—Warsaw Concerto—La Strada The Good Life — Canto d'Amour Divorce Italian Style") — More Mondo Cane")—Billy Liar.

The recording is excellent and the reo strings widely spread.

For Bilk fans, a must. For others, listening to La Ronde or Never On nday. They're hard to resist! (J.R.)

* * *

IE FRANZ LISZT STORY—Carmen Cavallaro at the piano. Calendar Records stereo, SR66-93. Also in mono on R66-3.

Interest: Liszt-Cavallaro. . . .
Performance: Cavallaroesque.
Recording: Very good.
Stereo: Fine.

A disc of arrangements of Liszt music well-known pianist Carmen Caval- o. Those who like their music with fairly strong Cavallaro touch will no ubt enjoy it very much; but those o rather liked the Liszt music as it s might be somewhat less impressed. cepted as a Liszt-Cavallaro hybrid, makes quite pleasant listening.

The tracks are titled Hungarian Rhap- ly No. 2—Liebestraum—Les Preludes Hungarian Rhapsody No. 13 — La mpanella — Concerto No. 1 — Hun- rian Rhapsody No. 12 — Hungarian apsody No. 1 — Spanish Rhapsody Hungarian Rhapsody No. 6.

The recording and stereo are of a h quality, making the disc good value money as an economy pressing. R.)

* * *

STRING GUITAR! The Folkswingers. Glen Campbell, 12-string guitar; Rod Dillard, guitar; Doug Dillard, banjo; Dean Webb, bass. Festival stereo, SFL-931,932. (Also in mono on FL-31,932.)

Interest: 12-string folk guitar.
Performance: Swingin'.
Recording: Excellent.
Stereo: Wide.

Originally recorded for the American orld-Pacific" label, this disc features st Coast 12-string guitarist Glen mpbell picking his way very capably through a baker's dozen well-known folk tunes. The arrangements are fairly straightforward, although quite bright, and the backing is good from the Dillard brothers on guitar and banjo and Dean Webb on bass. It makes mighty enjoyable listening if you're partial to the swingin' 12-string.

The tunes are: If I Had A Hammer—Black Mountain Rag—Walk Right In—Wildwood Flower — The Answer Is Blowing In The Wind—Midnight Special — Cottonfields — Columbus Stockade Blues—Rye Whiskey—Bull Durham—Wabash Cannonball—Dark As A Dungeon—This Train.

The recording is excellent and the stereo wide.

For 12-string fans, warmly recommended. (J.R.)

* * *

FOR MY TRUE LOVE. Laurindo Almeida, guitar; Salli Terry, mezzo soprano; Martin Ruderman, flute. World Record Club stereo, ST-4084. (Mono, T-4084.)

Interest: Love songs, old and new.
Performance: Delicate, sensitive.
Recording: Excellent.
Stereo: Smooth.

A delightful collection of songs old and songs new based on the theme of human love, with well-known guitarist Laurindo Almeida providing principal accompaniment and instrumental interludes on the guitar and lute. The singer is Salli Terry, who will be familiar to some as soloist-arranger with the Roger Wagner Chorale; Miss Terry has a delicately clear mezzo soprano, and she sings with great sensitivity. Her fine singing and Senor Almeida's skilled playing makes for most enchanting listening.

In time, in country of origin and in style the songs vary quite widely: from the traditional North Carolinian lament Lass From the Low Countree to contemporary Brazilian composer Jayme Ovalle's complex Modinha. There are a Jota, a Cancion and a Polo by Manuel de Falla; the Op. 50 Pavane by Gabriel Faure; the traditional Black Is The Colour Of My True Love's Hair; the lovely seventeenth-century galliard Come Again, Sweet Love Doth Now Invite, by John Dowland; Passarinho Esta Cantando, by Francisco Mignone; a lute Prelude by Robert de Visee; the French-Canadian folk song Au Bois du Rissignolet; the eighteenth-century composer Martini's famous Plaisir d'Amour;

"WOW!"

FRANKIE CARLE. Great Honky Tonk Piano Favourites. Electronic Stereo, RCA Camden CAS-950. Also available in mono CAL-950.

Interest: Super honky tonk.
Performance: Never heard better.
Quality: Outstanding.
Stereo: Simulated but wow!

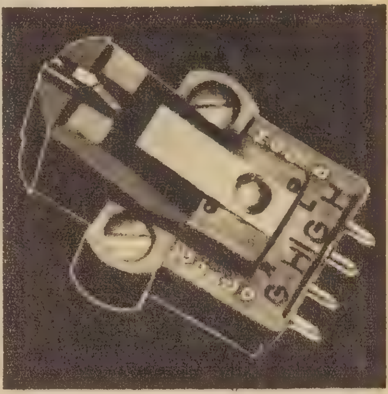
Maybe it caught me in just the right mood, but, frankly, I've never enjoyed a honky tonk album anything like this one. Backed by his excellent rhythm group — banjo, guitar, percussion, etc., Frankie Carle is in superb form, extracting sound from the piano that, at times, is more akin to harpsichord.

Mixed up with all the virtuosity — and I think the group deserve more mention than they get—is a lot of fun as they send up some of the old tear-jerkers that belong to the same era as the battered upright and the coats-off pianist pictured on the jacket.

Memories—Who's Sorry Now — Nobody's Sweetheart—I Can't Give You Anything But Love—Frankie Carle Rag—I Wonder Who's Kissing Her Now—Just A Girl That Men Forget—Alexanders Ragtime Band — The Prisoner's Song—The Old Piano Roll Blues.

And the quality is really something, hard, clean and brilliant. In short, at Camden's price, an album that you simply can't pass up. (W.N.W.)

GRADO



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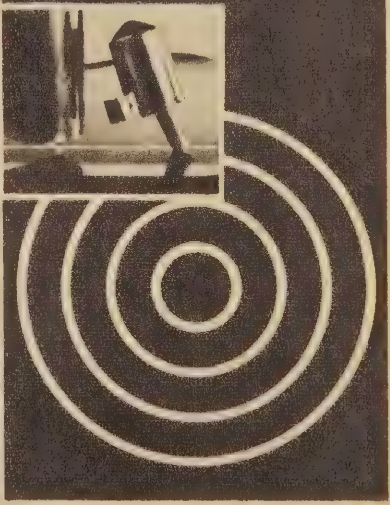

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16 rpm "Double-Play"

MUSIC FOR MILLIONS, Volume 1. Featuring the Singalongers 50 and the Lee Gallagher International Dance Band. Mono, 16rpm CREST DP-1. (Sound and Film Enterprises of Aust. Pty. Ltd., 291 Tooronga Road, Tooronga, SE6, Vic.)

Interest: Sing-a-long, Dance-a-long.
Performance: Average but bright.
Quality: Good through to mediocre.

At a time when there is so much emphasis on double-play and slow-speed tape, the management of the Australian "Crest" Studios have taken it upon themselves to remind discophiles about that fourth speed on their turntable — the one they may never have used.

Crest's very tangible reminder comes in the form of a 12-inch disc with no less than 27 tracks on its two sides, containing 59 songs and playing for 65 minutes. This is one disc where the titles won't be listed!

Not surprisingly, it's in a party album. You put it on and tap your feet to the procession of familiar songs in strict tempo, or sing right along with them, or get up and dance. The music is provided by "The Singalongers 50" and the Lee Gallagher International Dance Band — as you might imagine in typical dance palais style.

And what of the quality, in the technical sense? Over most of the tracks it's quite good and one could easily forget that there's anything unusual about the disc, were it not for the memory of the thing crawling around so slowly! But toward the centre, as the lineal groove speed falls away, tracing distortion gradually increases, though not to prohibitive limits for a party-cum-dance recording.

I don't imagine that the release is going to start any kind of revolution, but a handful of 16rpm double-play discs and a conventional changer would certainly add up to quite a lot of playing time for those who like background music. The price, by the way, is $5.50—about the same as you'd pay for some conventional LPs. (W.N.W.)

alliarda by the composer-father of ileo Galilei, the astronomer; A. Scar-i's O Cessate di Piagarmi; and finally works by J. S. Bach — the Gigue m the Lute Suite No. 1 in E and the g Bist Du Bei Mir written for his e, Anna Magdalena.

he recording and stereo are of excel- quality, making the disc a particu-y good choice for anyone who may seeking such an anthology of ever-en love song. (J.R.)

* * *

ARLIGHT CONCERT—The Hollywood Bowl Symphony Orchestra, conducted by Carmen Dragon. World Record Club stereo, ST-4040.

Interest: Popular classics.
Performance: Smooth.
Quality: Fine.
Stereo: Smooth, wide.

disc of popular classic lightweights m Carmen Dragon and the well-own Hollywood Bowl Symphony, ginally recorded for the American pitol label. Although the performance trifle cool and restrained, it is very ooth and the disc would be fine as ner music or for entertaining.

The pieces played are: Finlandia elius)—Flight of the Bumblebee msky-Korsakov)—Invitation to the nce (Weber—None But The Lonely art (Tchaikovsky)—Clair de Lune bussy)—Valse Triste (Sibelius)—ngarian Dance No. 5 (Brahms)—mp and Circumstance No. 1 (Elgar).

he recording and the stereo are both high quality. (J.R.)

* * *

ORGE WRIGHT At The Wurlitzer Pipe Organ. Stereo, Universal Record Club U748.

Interest: Giant Wurlitzer.
Performance: Usual high standard.
Quality: Good.
Stereo: Plenty of spread.

his is another one of the relatively ent discs recorded by George Wright his own studio, on his own giant Wurlitzer. Or should we say Wurlitzers (plural)? According to the jacket notes, the organ nowadays contains the works or more like three Wurlitzers, plus other pipe ranks collected from various sources.

And needless to say, George Wright, in his inimitable way, has a real ball with the tremendous sonic resources. He plays: Golden Wedding — Voices of Spring — Bill Bailey, Won't You Please Come Home—Mattinata—Come Back To Sorrento—There Is A Tavern In The Town—The Stars And Stripes Forever—Lotus Land—Frankie And Johnny—Ay-Ay-Ay—The Burning Of Rome.

As with all the other recordings made in his own studio, this one boasts excellent quality, with none of that annoying tape hiss that marred his (and other) early organ recordings.

If you want a sample, try his tremendous "Stars And Stripes" that opens side 2 — and then keep on listening! (W.N.W.)

* * *

TONIGHT, WITH DON LANE. Arrangements and Musical Direction by Geoff Harvey. Stereo, HMV OCSD 7655. Also available in mono, OCLP 7655.

Interest: Popular TV star.
Performance: Characteristic Don Lane.
Quality: Good.
Stereo: Normal spread, separation.

There is probably no better-known personality on Sydney television than Don Lane, compere of the TCN 9 twice-weekly "Tonight" show. Brought in originally during January, 1965, to fill a short-term engagement, Don Lane made an immediate hit with the TV audience and has been on the job ever since, singing, doing comedy spots, adlibbing commercials, interviewing celebrities and generally holding together a variety show that all too easily could fall apart.

Those who watch Don Lane on television, even occasionally, won't listen to

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as a normal album; they'll supply
own "visual," not forgetting that
but very capable musician Geoff
ey.
utsiders" will probably wonder
all the fuss is about, but what's
dds? This is one by Don Lane,
Harvey and "the boys in the
stra" for their regular fans, with
al numbers that they've had rather
than the usual time to organise:
Me Sing, I'm Happy—This Is All
—You Must Have Been A Beauti-
aby—In The Wee, Small Hours—
ica Farewell—My Kind Of Girl—
s All — Nobody's Sweetheart — I
You Love—London By Night—
y, Goody—Solitaire—Scarlet Rib-
— A Lovely Way To Spend An
ing.
that's missing is 625 lines.
.W.)

★ ★ ★

**SIDE OF HEAVEN — Bing
Crosby. Selections from the motion
pictures "Doctor Rhythm," "Paris
Honeymoon" and "East Side of
Heaven." Calendar Records 12-
inch mono, R66-2.**

Interest: Economical vintage Bing.
Performance: Authentic!
Recording: A trifle elderly.

other of the recent releases on Fes-
Records' economy Calendar label,
one features "the old smoothie"
Crosby and his familiar "tired bari-
voice. He sings some not-so-
liar songs from three of his earlier
es: On the Sentimental Side—My
is Taking Lessons—This Is My
to Dream—The Funny Old Hills
obalai—You're a Sweet Little
tache—I Ain't Go Nobody (And
dy Cares For Me)—East Side of
en—That Sly Old Gentleman (from
herbed Lane)—Hang Your Heart on
ckory Limb—Sing A Song of Sun-
s. Perhaps the last will be about
best known, but all will be of in-
to Bing fans.

e backing is in the familiar style
e fox-trot era, bright but somewhat
alised. The recording is elderly but
quite good.

ainly for Bing fans, I think. (J.R.)

★ ★ ★

**LAWTON: SINGING BIRD.
Tina Lawton, vocal, with harp and
flute accompaniment. CBS 12-inch
mono, BP-233315.**

Interest: Australian folk singer.
Performance: Entrancing.
Recording: Excellent.

ose who still need convincing that
ralian folksingers are equal to the
would do well to listen to this disc
ell-known singer Tina Lawton. Folk
will knew Miss Lawton from her
ious disc on CBS (BP-233277) and
her many TV appearances. She
a most delicate and transparent
, and sings in a very warm and
nal manner.

this her second LP she gives a
entrancing performance. To be
there are a few weak spots and
all the songs quite come off; but
verall performance is very fine and
es very enjoyable listening. Miss
ton is very ably supported by South
ralian harpist Huw Jones, who also
nged the songs, together with flautist
ell King.

e songs presented are: Bobby Shaf-
-Springtime Is Returning—Robin
—Strawberry Fair—Garton Moth-
Lullaby—The Heron From Brecon
—The Nightingale—Singing Bird—Ballymore Ballad—In The Orchard—The Wee Cooper of Fife—Lagan Love—I Wish I Had A Shepherd's Lamb—Lisa Dear—Charlie Is My Darling—Will Ye Go, Lassie Go.

The recording quality is excellent, with crystal-clear treble and negligible tape noise.

For folk enthusiasts, warmly recommended. If you're sampling, I'd recommend listening to "Lisa Dear." (J.R.)

★ ★ ★

A RECITAL OF FOLK SONGS. Rosemary Voges, contralto, with Geoffrey Parsons at the piano. Decca Ace of Diamonds 12-inch stereo, SDD-135.

Interest: "Classical" folksongs.
Performance: Stolidly traditional.
Recording: Excellent.
Stereo: Good.

Although admittedly a recording of folk songs, this disc isn't really part of the current "folkie" school. As the clue word "recital" signifies, it is rather of the classical one-hand-tastefully-resting-on-the-grand-piano school. The songs are sung not because the singer feels they are worth singing, but as vehicles through which to display one's vocal expertise.

Miss Voges is a contralto, and apparently quite a good one; probably from the context of the classical folk singing school, she sings very well in this recital. And Geoffrey Parsons tinkles away there behind her in the best accompanist tradition. But to my mind the whole thing is just so stolidly traditional and antiseptic that it lacks all meaning. Certainly I find it had to believe that many would obtain much enjoyment from such a performance.

For what it's worth, the songs presented are: Searching for Lambs—Mary Had A Baby—The Loyal Lover—The Spanish Lady—Green Grows the Laurel—The Fidgety Bairn—Caleno Custure Me—Bobby Shafto—Johnny Todd—The Water of Tyne—As Johnny Walked Out—Susanni—Watching the Wheat—O Can Ye Sew Cushions—The Evening Prayer—Oh, Didn't It Rain.

The recording quality is excellent, and the stereo is good. (J.R.)

★ ★ ★

JEANETTE MACDONALD and NELSON EDDY. 16 Nostalgic Original Recordings of Music from their Golden Years in Hollywood. Mono, RCA Vintage Series, LPV-526.

Interest: Once-popular stars.
Performance: Once-popular style.
Quality: Acceptable.

It so happened that I elected to listen to this album directly after the Reader's Digest Tchaikovsky recording reviewed earlier. What a shock to the ears; what a difference between the RCA recordings from another era and the present Dynagroove!

But, after a few minutes of "acclimatisation" one can listen with nostalgic interest to these recordings of the two famous stars of the mid-thirties and, as noted above, the quality emerges as quite acceptable. The response of the early recordings is limited, but there is very little noise or distortion to mar the performance. In fact, you'll probably enjoy best the older recordings—when the stars were younger!

As per the title, the album contains 16 of their all-time favourites, all identified and dated. To mention a few

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2 "ADC Sixty" transistorised Amplifier—Orpheus silex turntable — ADC 40 Tone Arm ADC10E cartridge — 2 Leak "Sandwich" speaker systems $650.00

3 "ADC Sixty" transistorised Amplifier—Dual 1019 turntable choice of Shure M55E or ADC 660E cartridge — 2 Wharfedale "Dovedale" speakers or 2 KEF 'Cantata' systems. $621.10

4 Sansui 220 Tuner/Amplifier — Dual 1019 turntable choice of Shure M44 or ADC 790 cartridge. 2 Wharfedale "Dovedale" speaker systems $567.50

5 Sansui 220 Tuner/Amplifier Thorens TD135 player Shure M44 or ADC 770 cartridge. 2 Wharfedale golden 10RSDD. Speakers in 2 cubic foot enclosures $423.50

6 Star SA30 Amplifier—Garrard SP25 Player—Sonotone GTA ceramic cartridge or Decca Deram. 2 Magnavox 8WR 8in speakers. 2 Slimline enclosures $227.40

7 Star SA30 Amplifier—Garrard SP25 player. Choice of Shure M44-7 or ADC 770 Cartridge—2 Wharfedale. 8 Bronze RSDD Speakers. 2 Slimline enclosures . $231.40

8 Pioneer SM83 Amplifier. Thorens TD135 player—Shure M44-7 or ADC 770 cartridge—2 Wharfedale "Dovedale" speaker systems $529.50

9 AKAI A5000 Transistorised Amplifier. Lencos G99 Turntable ADC 40 tone arm—ADC 770 cartridge 2 KEF "Cantata" speaker systems $600.00

10 Leak Stereo 20 Amplifier and Labcraft 605L turntable. All balance tone arm. Shure M44-7 cartridge. 2 Wharfedale Linton speaker systems $471.00

11 Leak Stereo 20 Amplifier Dual 1019 turntable. Shure M55E Cartridge .. .. $345.10 Loudspeakers extra to choice.

12 Leak Stereo 30 Amplifier — 2 Leak "Sandwich" speaker systems $486.00 Record player and cartridge extra to choice.

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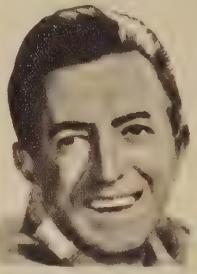
Italian Street Song (1935)—I'm Fa
In Love With Someone (1935) —
Sweet Mystery Of Life (1936) — I
Marie (1935) — Farewell To Dre
(1936) — Lover, Come Back To
(1939)—I'll See You Again (1947).

The jacket carries copious notes
small type, about the two stars, a
their early stage careers, their H
wood successes and their failures.

Nostalgia plus! (W.N.W.)



POPULA
JAZZ

By
GRAEME BEI

ENCYCLOPEDIA OF JAZZ RECORDS. Vol. 1, Jazz of Twenties. Universal Re Club, UJ-641.

Interest: Vintage Jazz.
Performance: As it was then.
Quality: Good remaster.

You can get most things in a pac
deal these days, and jazz is no except

One remembers how twenty-five y
ago it would take months and o
years of searching to acquire the d
early jazz classics on 78 r.p.m. incl
in the above album.

Jazz critic Leonard Feather has c
piled these encyclopedia series and
course, an excellent job has been d

In this package deal you have cla
by King Oliver, New Orleans Rhy
Kings, Johnny Dodds, Jimmy No
Jelly Roll Morton, James P. John
Benny Goodman, Duke Ellington,

* * *

ENCYCLOPEDIA OF JAZZ RECORDS. Vol. 2, Jazz of Thirties. Universal Record Club UJ 769.

Interest: Jazz of the 30s.
Performance: As it was then.
Quality: Good remaster.

Here's Volume 2 of the jazz ency
pedia series, compiled by Leor
Feather, and this one, with the excep
of a track by blues singer Rosetta Tha
concerns itself with some of the lea
big bands of the time, such as Glen G
Dorsey Brothers, Andy Kirk, Flet
Henderson, Glenn Miller, Count B
and Jimmie Lunceford, etc.

Of particular interest is the 1
"Sing Me A Swing Song" by C
Webb's band, with a very young
Fitzgerald, in whose singing one can
ready discern the beginnings of an
dividual jazz style, the development
maturity of which was to shake
world many years later.

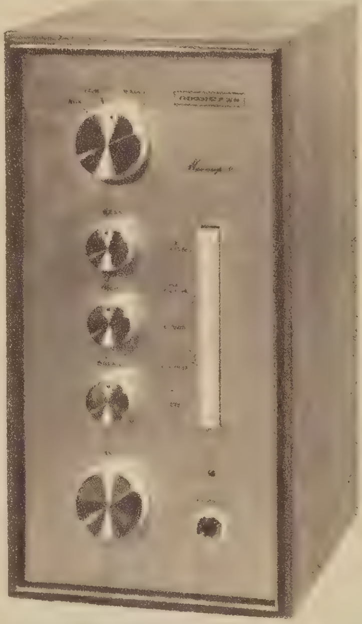
John Kirby and his Onyx Club
play "From A Flat to C," a composi
by pianist Billy Kyle, who was with
Kirby band. He later became pop
with Australian audiences as L
Armstrong's pianist, which chair he
for many years until his death, jus
few months ago.

These encyclopedia albums are e
lent value, and it means that one
"chuck out" some more old and
78's, which take up a lot of room
leave a lot to be desired as far as re
duction is concerned.

TRADE REVIEWS AND RELEASES

GOODMANS "MAXAMP 30" IMPRESSES

Having set something of a precedent with their tiny "Maxim" loud-peaker system, Goodmans Industries Ltd., have followed it up with styled-to-match amplifier — their first venture into the amplifier field.



tually all other high fidelity amplifiers ntly on the market exploit the "hori-l" concept. Japanese designs in par-r emphasise a wide, not very high , carrying an array of controls, suffi- to impress the initiated and uninitiated These are often matched by an ly imposing array of sockets and gad- at the rear, with the promise of being to feed anything in and take anything provided one can remember how to e" everything.

e emphasis in the Goodmans Maxamp all the other way.

It is compact, with the evident inten-of occupying a minimum of space on kshelf.

It employs a vertical styling, with the object in view, matching the dimen- of the "Maxim" loudspeaker system.

It avoids the heavily "technical" look, still offering a useful and practical of facilities.

a matter of further interest, it is an all state, all silicon design, reportedly the uch design to emerge for the British ndustry.

erall measurements are quoted as 5½ x 7½ inches deep, the cabinet g a teak wood-grain finish. In both nd finish it matches the Maxim loud-er, though it differs in the important t that the amplifier must be allowed air movement around the cabinet for ation and cooling.

nust certainly be acknowledged as an native design, with an external appear- that will appeal to many potential ners. To judge by inspection, it is well ucted and readily accessible for ser- should that ever be necessary.

nsidering, in order, the various specifi-s and facilities, the Maxamp 30 will input signals from magnetic pickup V, 47K, RIAA); high output magnetic ezo (50mV, 100K, RIAA); radio tuner nilar (100mV, 100K, flat); tape recor-.50mV, 100K, flat); microphone, tape etc. (3mV, 50K, flat). All these inputs checked and found to conform very y to the quoted sensitivity figures.

desired signal source is selected by of a switch on the front panel.

the output end, the amplifier may be l into loudspeakers reflecting loads of r 16 approx. ohms. The manufacturers he amplifier at 15 watts RMS per el into an 8-ohm load and 10 watts per channel into either 4 or 15 ohms, reference distortion figure of 0.4 per t 15 watts at 1KC into 8 ohms.

hese figures would indicate, the manu-ers have made no effort to publish sive looking figures of power output. tions are that the distortion level somewhat with load and frequency—vards as well as upwards—but the significance is that the rated power is available under all conditions of ncy and load, with distortion levels "fractional percentage" area.

power levels at the verge of overload, ged on a CRO, are much higher than the aforementioned figures. Typically, we measured around 25 watts per channel into an 8-ohm load, and about 17 watts into 15 ohms. Into 4 ohms, attempts to measure maximum "undistorted" power on 1KHz tone took the fuse, doubtless included in the design for the very purpose of protecting the output transistors against excessive peak currents.

All told, however, our impression and that of other reviewers in overseas journals, is that the Maxamp 30 has been rated with notable modesty in respect both to power output and distortion.

On the other hand, we could not quite duplicate the specifications on frequency response, which claim 20Hz to 20KHz at plus and minus ½dB. With the controls set for level over the major audible range, a drop was evident below 30Hz, though this is of no significance in terms of program material.

We found, by the way that level response over the major audible range was obtained with the bass control in the "12 o'clock" position and the treble control at "1 o'clock," leaving little to complain about, in terms of their calibration.

The extent of the control available was quite normal, the bass control giving a range of minus 12 to plus 14dB at 50Hz and the treble control minus 12 to plus 13dB at 10KHz. These figures are equal to or slightly in excess of specifications.

Over and above the tone controls, two filters are available through push-button switches.

The high frequency filter is intended for use on old records or other poor program material but its measured attenuations of 3dB at 10KHz and 16dB at 20KHz would appear to be quite inadequate for this purpose.

The low frequency filter, intended to offer some protection against turntable rumble, etc., offers a more realistic figure of minus 10.5dB at 20Hz, almost "spot-on" the specifications.

Other push buttons on the panel parallel the channels for mono reproduction, silence the loudspeakers for earphone-only listening and switch the amplifier off-on. A tiny bezel indicates "power on" and a stereo jack provides ready access for stereo headphones.

The controls, arranged in vertical line, as pictured, are Input Selector (at the top) then Bass, Treble, Balance and Volume.

Tested under practical listening conditions, the amplifier lives up fully to expectations, based on inspection and specifications.

There is ample gain for low output magnetic pickups, with adequate frequency compensation. At normal listening levels and at the normal listening distance, hum and background noise are low enough to be inaudible.

All controls operate very smoothly and efficiently except for the treble filter which, we feel, should be made much more "savage" in its effect.

Almost needless to say, the tonal qualities are excellent, the amplifier specifications being well ahead of likely "peripheral" equipment.

In short, the Maxamp 30 must be regarded as an excellent high-performance, solid-state amplifier, unusual in presentation and with a special appeal to those with limited space in the listening room.

The Maxamp is available through most trade and hi-fi houses. It is distributed in Australia by British Merchandising Pty. Ltd., of 60 Clarence Street, Sydney. They quote the retail price at $259.26. (W.N.W.)

PYE "POCKETFONE"

PYE PTY. LTD. has been demonstrating in Australian capital cities a new lightweight miniature VHF radio-telephone for personal use developed in U.K. by Pye Telecommunications Ltd. Called the Pye Pocketfone, it is designed for communication between a control centre and individuals in urban areas. It is said to give good penetration of buildings and heavily screened areas and to be suitable also for on-ship operation. The makers claim that these qualities make it ideal for police, fire service, Customs and security force use.

The solid state transmitter and receiver have their own power supply, yet weigh less than 10oz each and fit easily into a man's suit pocket. The Pocketfone has an RF output of 80mW and operates in the relatively uncongested VHF band between 450 and 470MHz. It is said to provide interference-free operation over a radius of 2-5 miles.

Mr Mike Sheedy, N.S.W. manager of Pye (left) and Mr John Drury of the Customs Department at a demonstration of the Pye Pocketfone in Sydney.

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:on Unilateral Switch (SUS) has r characteristics to the Shockley (four diode, and is suitable for SCR or triggering and digital applications, as as for light dimmers and speed con-

:on Bi-lateral Switch (SBS) is simply ateral version of the SUS, and switches her polarity with exceptionally good etry. Essentially, it consists of two devices integrated in the same pellet, to back.

ther information and prices are available from A.G.E. offices at 103 York , Sydney and 552 Lonsdale Street, ourne.

ERSON AND CUMMING INC., of .., have developed a new epoxy com-on moulding powder, Eccomold HT-50 can be moulded below 100psi, pro-moulded items with densities as low lb per cu. ft and has a heat dis-n temperature above 500 degrees F.

makers say it exhibits outstanding ion to inserts, excellent moisture re-ce and very low thermal co-efficient xpansion. For these reasons, the ial is regarded as particularly useful oulding around electronic components nall inserts.

representative range of samples noulded in "Eccomold HT-50."

al agents for Emerson and Cuming Vm. J. McLellan and Co. Pty. Ltd., rescent, Kingsgrove, N.S.W.

RRIS BROS. PTY. LTD. advise that ppointment of Telcon as wholesalers elecomponents television and radio and replacement parts, which they nced recently, applies not only to the n Brisbane branches but also the ide branch. This business is conducted 6-270 Sturt Street, Adelaide (phone 1) under the management of Mr John 1.

E DUCON POWER EQUIPMENT SION of the Plessey Components has received orders totalling about 00 from the Electricity Commission S.W. for 100 capacitor voltage trans-rs of 132KV capacity and spares. The ormers will be installed in sub-stations ewcastle, Canberra, Dapto, Liverpool lsewhere, for metering, protection and unication purposes.

NIKKA PICKUP ARM FROM ENCEL

We recently tested in our laboratory one of the new Nikka tone arms made in Japan by Chiyoda Electronic Co. Ltd., and currently available in Australia from Encel Electronics. Although of impressive appearance and an excellent performer, the tone arm sells at a quite modest price.

The Nikka CP-3 arm which we examined is typical of the high quality audio equipment coming from Japan these days, being of pleasing design, ruggedly built and finished to a high standard in bright chrome. The head shell is of brushed (matt finish) aluminium and is attached to the tone arm by means of the now popular screw collar, which has proved very satisfactory in other good quality arms (notably the Ortofon and SME).

The arm is supplied packed in foam plastic for protection, with all necessary fittings and accessories, comprising connection lead, fixing hardware including spanner and screwdriver, and a simple but effective stylus pressure gauge.

The connecting lead attaches to the tone arm by a five-pin plug and socket, while the other end of the lead is fitted with moulded-in standard audio plugs. The fifth wire in the lead is for earthing the arm only. A separate earth lead must be used for earthing the turntable to the amplifier, where such earth is normally required.

Mounting the arm to the turntable baseboard requires only one hole to be drilled with a 1in auger. The pillar can then be pushed through the hole and locked into position by means of the locking nut and washer provided. Since no template is provided to assist in positioning the hole, some careful measuring is called for.

Full details of mounting dimensions are given in the instruction leaflet but purchasers who have had no previous experience in mounting tone arms would be well advised to seek the assistance of the suppliers, particularly as the same leaflet does duty for two models with different dimensions. This could lead to some confusion.

Setting up the arm is quite easy, with the two adjustments provided. Static balancing is by means of a large rear-end counterweight, which is adjusted by screwing it along a thread. Stylus pressure is then set by adjustment of a small counterweight fitted to a calibrated arm of the "outrigger" type, graduated in half-gram steps. After adjustment, both weights are locked in position by grub screws.

The outrigger arm provides a predetermined amount of compensation for the offset head shell and therefore contributes to dynamic balance.

Vertical and lateral movement appears to be very smooth with no evidence of friction, and we understand that this is achieved by the use of miniature ball races. The maker's specification says that special alloys are used in the construction to minimise resonance effects.

For performance tests we retained the "Micro" magnetic cartridge previously fitted into the head by Encel Electronics.

Specifications for the arm show that it is designed to track at stylus pressures as low as half a gram, so we adjusted the stylus pressure accordingly. We found that the arm will indeed track under these conditions, without groove jumping or skating, even with loud passages towards the centre of the disc, where conditions are most severe. However, the cartridge is designed to operate at 1½ grams, and was not able to reproduce undistorted sound at the half gram pressure. It nevertheless proved the point.

When pressure was adjusted to 1½ grams, no distortion was noticeable.

The graduations of the calibrated arm used for adjustment of stylus pressure were compared with a stylus pressure gauge and found to be accurate and reliable.

We feel the instruction sheet provided is too sketchy, and a notable omission is lack of guidance in fitting a cartridge in the head shell to ensure correct placement with respect to tracking error. However, we understand from Encel Electronics that a better instruction leaflet, and possibly a mounting template, may be available shortly.

In short, we were quite impressed with the construction, finish and performance of the Nikka arm —and the fact that it sells for the very modest price of $19 retail. We have not seen the Nikka CP-2 tone arm which we believe is also available from Encel but, from the illustration in the leaflet, it appears to have a few extra refinements, and is presumably a little more expensive. (H.A.T.). ▬

AMALGAMATED WIRELESS VALVE COMPANY PTY. LTD. has added three new RCA silicon NPN transistors to its semi-conductor range.

RCA-2N3632, 2N3553 and 2N3375 are all epitaxial silicon planar types intended for large-signal high-power VHF-UHF applications in class A, B or C amplifier, frequency multiplier or oscillator operation. They all employ the "overlay" concept of emitter-electrode design.

A brochure containing full technical details, typical circuits and performance data is available on request from the AWV head office at 348 Victoria Road, Rydalmere, N.S.W.

HANIMEX PTY. LTD. and **FESTIVAL RECORDS PTY. LTD.** have concluded arrangements under which Hanimex have acquired the rights for the production of pre-recorded tapes from the Australian and overseas catalogues from which Festival produces its recordings. Hanimex recently announced that it was producing in its Brookvale plant (N.S.W.) its own brand of recording tape, and the pre-recorded tapes will be recorded on the Hanimex brand, in mono and stereo versions. The company expects to release its first list of titles in October.

(Continued on Page 125.)

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Mullard 2-2
Mullard 3-3
Mullard 10-10
Philips Twin Valve 10
Playmaster Twin 10
Playmaster Twin 17
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Playmaster Unit 2
Playmaster Unit 3
Playmaster Unit 4
Playmaster 101
Playmaster 105

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Standard 50W
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Mullard 3V
Transistor Mono
Transistor Stereo

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D.C.-D.C. 40W
D.C.-D.C. 60W
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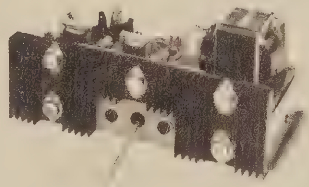
Pattern Generator
Diode Noise Generator
G.D.O.
Transistor Wave Meter
Transistor Signal Tracer
Transistor Pattern Generator
Valve and Transistor Tester
Millivoltmeter
Distortion Noise and Millivoltmeter
Mullard Tachometer
Electronic C.R.C. Switch
Geiger Counter

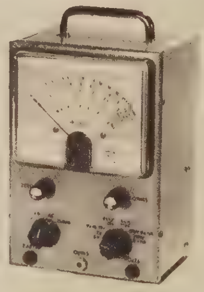
RECEIVERS
DXERS (Batt.) 1
DXERS (Batt.) 2
DXERS A.C. 2
DXERS A.C. 3
DXERS, 3 Band 3
Interstate 5
Fremodyne 4
Amateur RX
Transistor 1
Transistor 2
Transistor 3
Transistor 4
Transistor
Transistor (R.F.)
Transistor
Transistor 3 Band

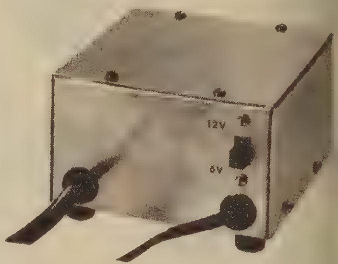
TRANSMITTERS
V.F.O. 196
Remote V.F.O. 196
144 MC/S A.M. TX
144 MC/S S.S.B. TX
1962 S.S.B. TX
144 MC/S Linear Final

MISCELLANEOUS
Light Beam Relay
Flasher Unit
Regulated 9V D.C. Supply
Universal Battery Charger
Intercomm. Unit
Metronome Unit
Porta Player
TV Hearing Aid

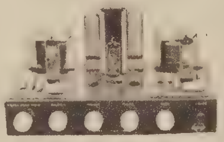
If you cannot see your project listed—write for a quote, we have many other units available or in development


Playmaster 113

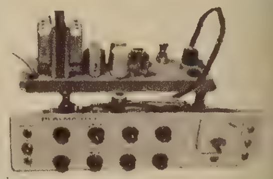

1966 VTVM



Battery Charger


Mullard Stereo 3.3

.103 Guitar Amp.


Playmaster 110 Tape Amp.

ELECTRONIC DEVELOPMENTS PTY. LTD

Phones 63-3596
63-5973

232 FLINDERS LANE
MELBOURNE . . . . VICTORIA

Phones 63-3596
63-5973

ade In Brief — cont.

**IALGAMATED WIRELESS VALVE
IPANY PTY. LTD.** has released de-
of a new high-quality instrument
de ray tube.

e T948 5in P.D.A. mesh tube is de-
d for use in high-speed wide-band pre-
oscilloscopes, and has a special de-
of post deflection accelerator mesh and
iced gun design to provide the
es required for modern transistorised
oscopes. The faceplate is flat clear
with aluminised screen. The tube is
ble with blue-green or yellow-green
or, both of which have medium short
stence.

er features are: High X and Y sensi-
s of 9V/cm and 3V/cm respectively;
brightness, giving high writing speeds
negligible distortion; uniform deflection
ivity with changes of screen potential
6 to 15KV; low deflector plate in-
nce and interplate capacitance; low
ground illumination.

rther details are available from AWV
office, 348 Victoria Road, Rydalmere,
V.

**ANDARD TELEPHONES AND
LES PTY. LTD.** has announced the
ntment of Mr J. B. Scott as assistant
ging director and associate director of
oard. He will be in charge of the
any's Liverpool (N.S.W.) operations.
Scott has been with S.T.C. for 32
and before his transfer to the Liver-
branch served as product line manager
e line transmission division at Alex-
a (Sydney) for three and a half years.

other recent S.T.C. appointment is that
r R. T. Johnson as comptroller of

J. B. Scott

Mr R. T. Johnson

ompany. Simultaneously, Mr Johnson
een appointed a director of Austral
ard Cables Pty. Ltd., S.T.C. Invest-
Ltd. and S.T.C. Finance Ltd. He has
25 years service with the company,
prior to his present appointment was
y comptroller.

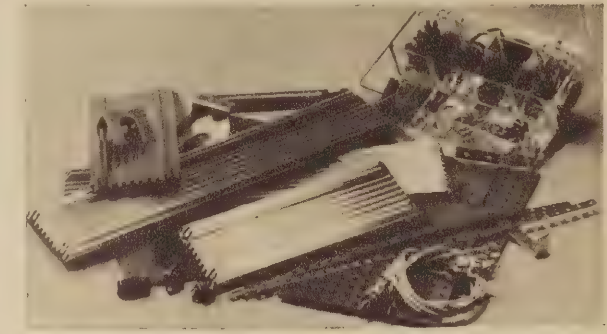
RIAN PTY. LTD., a wholly owned
iary of Varian Associates, of U.S.A.,
een established in Australia and is
ing from premises at 38 Oxley Street,
s Nest, N.S.W. Varian Associates are
f the largest electron valve manufac-
in the U.S.A., and have as subsidiary
anies such well-known names as
, Bomac and National. The general
ger of the Australian company is Mr
odes, while Mr L. A. Wade is senior
ting engineer, electron tube and device
.

SSEY ELECTRONICS GROUP has
ited an Australian scientist, Mr Keith
well, as head of the group's new
l research and development labora-
n Melbourne. Mr Hollywell will be in
of scientific teams conducting pro-
of pure and applied research into
electronics, sonar, defence radar, air-
and ground civil radar and oceano-
y.

the past seven years, Mr Hollywell
een a senior research scientist with
y in England, and his return to Aus-
is regarded as an important reversal
e "brain drain" of Australian scien-

I.R.C. MARKETING VECTOR CHASSIS KIT

A new type of chassis kit which allows experimental circuits to be quickly built up without soldering is available from International Resistance Company. Called the Vector Experimenters Chassis Kit, it is made in U.S.A. by Vector Electronic Company, Inc.



The basic idea of the Vector kit is to provide a means of fixing and interconnecting electronic components so that experimental layouts can be built up quickly and conveniently and afterwards dismantled.

We recently had the opportunity to examine one of the basic kits, the Type 22X, which is intended mainly for building transistorised circuitry (although valve sockets may be mounted, if desired). The kit comprises basic metalwork for construction of a chassis measuring 8-5/8 x 5 x 2in with mounting and interconnecting accessories for passive components and push-in type sockets for transistors and diodes.

The actual chassis is built up from four side pieces made from extruded aluminium, with mitred corners for a neat finish. These side pieces are held together by small right-angled corner brackets which slot firmly into channels on the interior faces of the side pieces.

Also on the inside faces are channels into which a piece of matrix board supplied with the kit makes a neat fit. While only one piece of board to fit the chassis is supplied with the kit, there is provision for mounting a board in this way at both top and bottom of the chassis, and additional boards of the correct dimensions can be supplied as an extra. Two smaller pieces of board are included with the basic kit, which can be mounted above the main board by means of "Z" brackets also supplied.

The various accessories provided will allow a complete circuit to be built up without soldering any of the components. Resistors and capacitors are held in position and interconnected by means of solderless terminals, of two types, viz., a springclip type with a spring loaded washer to hold the lead wires of components; and a simpler type with tapered serrated slots which hold the lead wires by wedging action.

Interconnection between components can be carried out by means of patch cords fitted with corrugated spade-type terminals which slip between the coils of the spring clip terminals where they make a firm connection. Bus bars with perforations to match the holes in the matrix board are a useful feature of the kit, since they reduce the necessity for patch cords.

Potentiometers, switches and similar hardware are mounted by means of slotted metal brackets. The kit also includes screws, nuts and bolts and spacers.

Layout paper coded along the edges is another thoughtful provision for planning or recording. However, we felt that the suppliers could well have made more than a token gesture in this regard, and that to restrict the initial supply to only three sheets is rather an unnecessary economy. Since several sheets could well be needed for even one layout, the user could find himself embarrassed by a shortage of layout paper at even his first attempt to use the kit.

In practice we found the kit very easy to assemble and experienced no difficulty in mounting various components in the manner suggested in the instructions.

Once the layout of components has been translated into a diagram on the layout paper, it should be possible to build up a circuit quite rapidly, and to interchange components within seconds, thus allowing the effects of different component values to be observed without the need for soldering and unsoldering.

Other advantages of the system are the impossibility of heat damage to components through soldering, and the economy which results from complete recovery of components after each experimental set-up is dismantled.

The price of the basic Type 22X kit is $21. As mentioned previously, this kit is intended mainly for transistorised circuits. Another kit intended for use with valve type circuits is also available for the lower price of $12.50.

Those requiring further information and details of additional accessories available should write directly to the importers, International Resistance Company Pty. Ltd. (Elco-Vector Division), The Crescent, Kingsgrove, N.S.W. (H.A.T.) ■

A.E.I. ENGINEERING PTY. LTD. is marketing a transient voltage surge counter developed to replace rule of thumb methods used in designing protection circuits for semi-conductor devices. The new device is made in U.K. by A.E.I. Electronics Ltd., of Leicester.

The makers say the unit is portable, simple to operate and specially useful where pulses occur at irregular intervals. Four counters are provided, each actuated at a particular voltage that can be preset between 10V and 5KV, where the range of the instrument does not exceed a 30:1 ratio. The instrument is battery operated and, once connected, can operate for two years or one million counts.

The circuit to be monitored is connected via a cable and a plug mounted on the unit's front panel. Any voltage at the input terminals above the preset level of any of the four counter channels is recorded on the corresponding counter and all lower counters.

The standard instrument priced at $335 has a minimum pulse width for a 10 per cent fall in sensitivity of 0.1 microseconds up to 100 volts and 0.1 microseconds per 1,000 volts, above 100 volts. Pulses up to 1.5KV with rise times of less than 1 nanosecond are registered and up to 5 surges a second can be counted.

Further details can be obtained from the A.E.I. head office at 95 Clarence Street, Sydney.

(Continued on Page 127.)

BARGAIN FOR OCTOBER . . . THE NEW PLANET MG-1504 STEREO AMPLIFIER

This extremely well finished stereo amplifier is also a fine performer . . . with a total power output of 15 watts (I.H.F.M.) and a frequency response of 30-20,000 c/s plus or minus 2db. Speaker matching for 4, 8 or 16 ohms. Valve complement 2 x 12AX7, 1 x 6AQ8, 1 x 6CA4, 2 x 6BQ5. Encel price is only **$59**

SPECIAL ANNOUNCEMENT

Encel Electronics Pty. Ltd. has been appointed Australian National Distributors for two of the United Kingdom's best known manufacturers . . .

CONNOISSEUR TRUVOX

A complete range of Connoisseur turntables and pickups is now in stock . . . also TRUVOX tape recorders, tape decks and solid state stereo amplifiers. For further details, see the full page advertisement in this issue of "Electronics Australia". Encel Electronics' **prices** will make these high quality products available to **thousands more** Australian music lovers!

"SARLON" SPEAKER FABRIC

Many types of **SARLON** acoustic fabrics are now available at Encel Stereo Centres . . . ask to see them! Several types are of particular interest to the ultra modern home owner.

FILM INDUSTRIES MICROPHONES

Encel Electronics are Australian Distributors for Film Industries Microphones . . . units supplied as standard equipment with Vortexion and Ferrograph recorders. The Model M8-A is a fine ribbon microphone with a substantially flat frequency response of 50-14,000 c/s . . . impedences are 50, 200 and 50 k ohms. Encel price is **$33** including Sales Tax. A recent U.K. review says: "The Film Industries M8-A Ribbon Microphone has a most attractive appearance coupled with a performance which, in many respects, can stand comparison with the best designs at three or four times its price." Encel price .... **$33** inc. Sales Tax

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HAMMOND CONDENSER MICROPHONES

As Australian Distributors, Encel Electronics proudly announce the arrival of the first Hammond shipments. The new Hammond Stereo Microphone is supplied complete with a power supply and is priced at **$118.** The monaural Model 101 with power supply costs only **$74** . . . the extra capsule may be added at a later date to convert to stereo use. Hammond microphones combine rugged construction with high performance and have been favourably reviewed overseas. Write for full specifications.

ENCEL WAREHOUSE STOCKS INCLUDE:

AMPLIFIERS: Acoustech, Leak, Sansui, Encel, Planet, Sound, Cosmos, Lux, Roland, Pioneer, etc.
SPEAKERS: Celestion, Kelly, Leak, Sonics, Chrysler, KEF, Wharfedale, Philips, etc.
TONE ARMS AND CARTRIDGES: ADC, Ortofon, Micro, Encel-Nikka, All Balance, JH, Pritchard, Decca, Leak, etc.
TURNTABLES: Connoisseur, Garrard, Lenco, Orpheus, JH, Labcraft, Thorens, Dual, Micro, PE, etc.
DICTATING MACHINES: Philips, Grundig Stenorette, Olympia.

WHAT IS AN EMQ?

Many Encel prices cannot be advertised because of trade agreements . . . so we invite you to write for an EMQ . . . an Encel Mail Quote. When requesting prices on amplifiers and tape recorders, please give some specifications. Combinations of many components are possible . . . just tell us of your requirements. Please supply your full name and address printed in BLOCK LETTERS.

CAMERAS AND PROJECTORS

A wide range of photographic equipment is now available . . . from leading Continental and Japanese manufacturers. All equipment is BRAND NEW. We cannot give phone quotations . . . trade associations frown on this practice. Call at Head Office, 431 Bridge Road, Richmond, Vic.

TAPE RECORDERS

Although our range of tape recorders is wide, Encel prices have assured speedy turnover . . . and Encel sales are at an all time high. Stock now includes: TRUVOX R44, R102-104, PD102-104; REVOX G36, two and four track —TANDBERG 64, and Series 12; AKAI M8, X4, 355, 1710, X100D — BEO-CORD 2000 and 1500 — SONY 500a 357/4, 200, etc. — NATIONAL 703S, 705, 755S, etc. — PHILIPS EL 3553, EL 3556, EL 3558, etc. — FERGUSON — GRUNDIG — LUXOR and many more. Save much more at Encel Electronics!

GARRARD TRANSCRIPTION TURNTABLES

Write for EMQ's. Models 401, Lab 80 and others are now in stock.

ACOUSTECH AMPLIFIERS

As Australian Agents Encel Electronics are proud to be associated with these famous American amplifiers, considered to be the finest in the world. The first two Acoustech shipments were sold out within two days of arrival in Australia! Of particular interest is the Acoustech Model V, an integrated solid state stereo amplifier with an output of 45 watts RMS per channel — a rating applicable throughout the extended frequency range. This model is priced at **$350**

THE ACOUSTECH X ELECTRO-STATIC LOUD-SPEAKER SOLID STATE AMPLIFIER STEREO SYSTEM

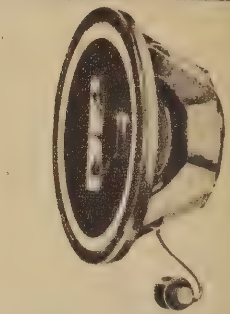
An all out form of integrated stereo, incorporating advanced amplifier and speaker techniques on a most elaborate scale. When used with the Acoustech VI Control Centre the combination represents the most effective stereo reproduction equipment available anywhere in the world. We use this phrase advisedly. This Acoustech equipment is built without compromise. If price is the least of your worries write for further information to Head Office, 431 Bridge Road, Richmond, Vic.

THE ALL NEW LUX SQ 101 SOLID STATE STEREO AMPLIFIER WITH SILICON TRANSISTORS AND 80 WATTS PEAK POWER OUTPUT!

Priced at only **$179** the mighty new LUX SQ101 amplifier has an input sensitivity as low as 1.8 mV, input for mag. p.u. being 3.5 mV. Distortion is negligible at normal domestic listening levels . . . and a unique tone control offers variable bass and treble crossover frequencies. Every useful tone and input facility have been provided. Send for full details. **(£89/10/-).** **$179**

Celestion

Stu
Ser



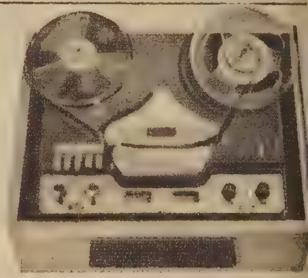
CELESTION HIGH FIDELIT CO-AXIAL LOUDSPEAKERS

Celestion 12" co-axial loudspeakers have received most enthusiastically by audie thusiasts and music lovers in Australia. Cl transient performance and attack are pa larly satisfying. Both models feature co tweeters with electrical cross-overs at 4 The Standard Model CX1512 has a frequ response **conservatively quoted** at 30-1 c/s and is rated at 15 watts RMS. Encel Price CX1512 ..... **$39.**

The "Celestion" Deluxe Model CX201 rated at 20 watts RMS and frequency res is **conservatively quoted** as 30-18,000 c/s special "Brilliance" control operates in tweeter circuit — the electrical cross-ov at 4 kc/s. See reviews in the "Gramoph p.511, April, '65, and "Hi-Fi News" p.75, June, '65. ENCEL PRICE: CX2012 .... **$**

SPEAKER ENCLOSURES

Both speakers perform extremely well in cu. ft. speaker enclosures; write to Electronics for details and specifica Speakers of similar UK price are us twice Encel prices in Australia.



THE REVOX G36 PROFESSION 2 OR 4 TRACK STEREO AND MONO TAPE RECORDER

Encel Electronics recommend this famous recorder. Three motors are featured in versatile two-speed professional quality corder which takes 10½" spools; ask for EMQ or a trade-in valuation on your old See Encel Stereo Centres for a Revox de stration . . . the price will pleasantly sur you!

SEE ENCEL STEREO CENTRE FOR REDUCED PRICES ON TH FAMOUS LEAK SANDWICH SPEAKER SYSTEM

Music lovers owe it to themselves to com the Leak Sandwich with any other spe system . . . in performance and price. new reduced price makes the Leak Sand better value than ever!

Encel Electronics Pty. Ltd.

Head Office: 431 Bridge Rd., Richmond, Vic. Tel. 42 3762
City Branch: 18 Bourke St., Melbourne. Tel. 32 2672
Sydney Store: 257 Clarence St., Sydney. Ground Floor, 2SM Building Tel. 29 4563, 29 4564

Australia's Greatest Hi-Fi Centre

Wholesalers
Trade-ins accepted

]ade In Brief — cont.

'M. J. MCLELLAN AND CO. PTY.). advises that a new large industrial lel has been added to the Dymo range ape embossing tools, capable of produc- ¼in lettering on ¾in tape. In addition ı large range of self-adhesive tapes in ured vinyl, copper, aluminium and ıless steel, a range of desk and door ıeplates holders is also available, which 'ide an easy method of producing staff ıeplates and door labels.

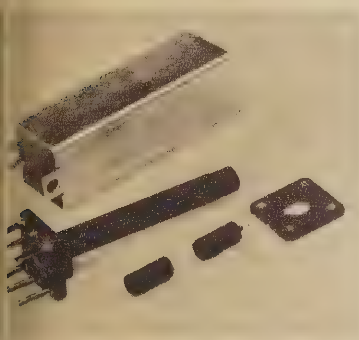
rom the same company comes news of ndustrial adhesive in Aerosol form which uitable for bonding a wide variety of erials. It is marketed under the name otch Spray Adhesive" and is described ı fast-drying, colourless heat and water tant rubber based spray adhesive. For her details, contact the company head e at The Crescent, Kingsgrove, N.S.W.

'ATKIN WYNNE PTY. LTD. will dle the range of coil formers and asso- ed componentry manufactured by sid Pty. Ltd., who do not have the lities to sell in small quantities.

hese items will be marketed only in aged assemblies, and individual com- ents will not be sold. The following mblies are currently available:

ıbminiature single IF assembly, six-pin :, 40c each.

ıbminiature double (vertical) IF assem- six-pin base, 60c each.



'ypical Neosid coil assembly kit as ıpplied, complete with cores.

ıbminiature double (side-by-side) IF mbly, eight-pin base, 60c each.

nshielded former assembly, 15c each.

' assembly, six-pin former, 40c each.

ıorter IF assembly, six-pin former, 30c ı.

ıort-wave former assembly, 20c each.

ll assemblies are supplied with the ssary cans, formers, cores and where ıired, rings and mounting clips. Prices subject to the appropriate rates of sales-

ırther details can be obtained from kin Wynne Pty. Ltd., 32 Falcon Street, v's Nest (P.O. Box 318), N.S.W.

.M.I. (AUSTRALIA) LTD. sends infor- on on two new items developed in the . by the Military Projects Division of ' principals, E.M.I. Electronics Ltd.

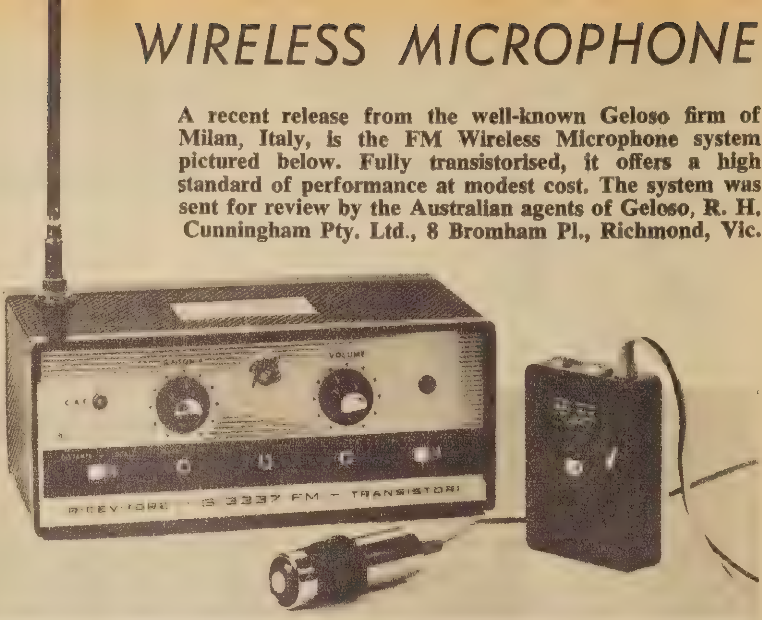
he first of these is the "Emicooler," ribed as a rapid cooling cryostat, which been developed to produce a tempera- below 90 degrees Kelvin within three nds in the presence of a heat load of While it has been designed specifically cooling semiconductor lasers, it is suit- for other applications where a rapid ing is essential and space is restricted. ling is produced by the Joule-Thomson t of a high-pressure gas expanding at ɔrifice. The expanding gas cools incom- gas, until liquid is formed at the orifice. es which liquefy near 90 degrees K are nitrogen, oxygen, air (with water and carbon dioxide removed) and argon.

The second item is a range of flexible high-pressure hoses designed to provide a safe and reliable means of making flexible connections in high-pressure gas systems. As they remain flexible when pressurised, they may be used for connecting parts which must move independently of each other while operating. They are said to be particularly suitable for use with high purity gases where it is essential that the pipework does not liberate adsorbed contaminants. The hoses consist of 12 small-bore stainless steel tubes brased into end fittings. The standard end fittings are finger tight couplings which mate with 5/16in Keelaring parts, but other terminations can be supplied if required. The outer protective layer is a spiral strip of nylon.

Inquiries should be sent in the first instance to the Australian company, E.M.I. (Australia) Ltd., Electronics Division, 301 Castlereagh Street, Sydney.

WIRELESS MICROPHONE

A recent release from the well-known Geloso firm of Milan, Italy, is the FM Wireless Microphone system pictured below. Fully transistorised, it offers a high standard of performance at modest cost. The system was sent for review by the Australian agents of Geloso, R. H. Cunningham Pty. Ltd., 8 Bromham Pl., Richmond, Vic.



The system comprises the microphone-transmitter unit type M20 and the receiver type G3337. Both are fully transistorised, the transmitter operating from a standard miniature 9V battery and the receiver from either 6 torch cells or the 240V mains.

The transmitter incorporates a Geloso M18 dynamic microphone which is provided with a neck band. The microphone is connected permanently to the transmitter proper via a small cable approximately 40in long.

The transmitter itself measures only 3½in x 2½in x 1¼in, and is quite light enough to slip into a shirt pocket. The aerial lead is approximately 30in long, and may either be left dangling from the pocket or worn inside the sleeve or coat. Controls provided on the transmitter consist of an on-off switch and a modulation control.

The receiver unit is mounted in an attractive dark grey hammertone case measuring 9¼in x 3¾in x 5½in. It is provided with a telescopic aerial extending to approximately 40in, a wire aerial and also a co-axial jack for the connection of a dipole antenna. The receiver is provided with AFC, a local-distant switch, a tuning control and AFC disable button for tuning, a volume control and a mains switch.

The system operates on 36.7MHz, which is one of the standard frequencies allocated for wireless microphone use. Overall frequency response is quoted as 100-12,000Hz. Our tests suggest that this is in fact achieved, and also show that the useable operating range should be adequate for all usual applications. Even in our steel-framed office building the noise level was commendably low with the transmitter some 25-30 feet from the receiver.

Output from the receiver unit is at a fairly low power level, being intended for feeding to PA amplifiers and tape recorders at the microphone or pickup inputs. However a monitoring jack is provided, to which may be connected optional earphones or a small loudspeaker unit.

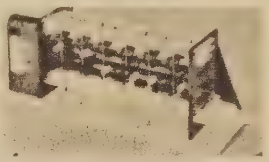
Considering the facilities which it offers, together with the performance attained, the system represents excellent value at the quoted trade price of $190 plus 12½ per cent sales tax. It would seem eminently suitable for theatres, lecture halls, churches, colleges and places of entertainment.

Enquiries should be directed to the agents, either at the address quoted above or at the Sydney address of 64 Alfred Street, Milson's Point, or to their agents in other capital cities. (J.R.)

BLACK LIGHT

SPECIAL New Black Light (Ultra Violet) Kit . . . Explore The Unseen World Around Us . . . Many Practical Uses For The Science Minded And Hobbyist.
Kit contains large 24" x 1 1/8" UV Tube. 24" white enamel housing with sockets, Transformer and Instant Starter, 3-core Safety Lead and Plug, Reflector, plus full instructions and suggestions.
Complete Kit ONLY $17.75 post paid. Includes FREE Strip Phospherent Tape for simple experiments.

Be prepared for the Computerised Future, learn how the giant electronic brains operate . . . with DIGI-COMP.



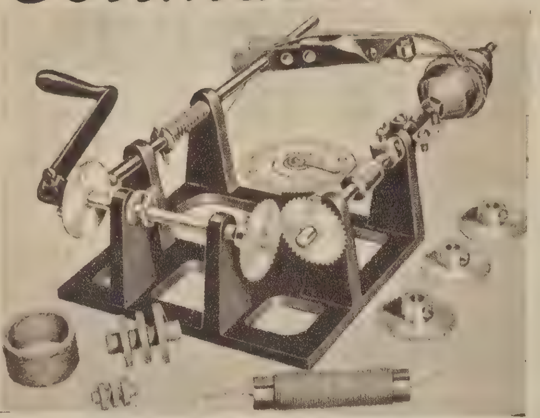
New working model Digital Computer. Easy to assemble from rigid plastic parts . . . Teaches Computer fundamentals, adds, subtracts, multiplies, complements, shifts, carries, memorises, compares, sequences . . . Kit includes step-by-step assembly diagrams plus 28-page manual covering operation, computer language (binary system), programming, problems and experiments . . . Complete at ONLY $10.95 post paid.
Also 50-page Programming Book for further experiments . . . $1.95 post paid.

SEND TODAY! SEND TODAY!

"NEW ERA" Dept. EL8

P.O. Box A 274
SYDNEY SOUTH, N.S.W.

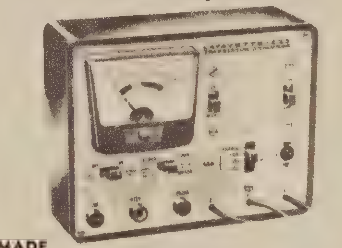
Coilmaster NEW DELUXE ACCURATE COIL WINDER



$13.95
£6/19/6

This new, Easy-to-Use machine winds honeycomb, spiderweb and solenoid coils of various widths and diameters — equal in appearance to a factory job. Also suitable for winding chokes, transformers and filter inductors. Indicator counts number of turns on coil. The COILMASTER is suitable for both experimental and practical work. Supplied with accessories including wood spools, metal pegholders and extension for making long solenoid coils. Instructions included, but less coil forms.

Lafayette Transistor Analyzer Kit



MADE IN U.S.A. 19-0901

6-IN-1 VALUE $28.95

• In-circuit and out-of-circuit Transistor Checker • Diode and Rectifier Checker • Signal Generator. • Battery Tester. • Voltmeter. • Milliammeter.

Lafayette's KT-223 Transistor Analyzer checks all types of transistors, including power types, also diodes and rectifiers. The in-circuit test couples the transistor to an oscillator circuit within the tester for an actual performance check. Externally the transistor is checked for leakage and beta gain in 3 ranges up to 200. The KT-223 makes trouble-shooting transistor radios easy by supplying a 5kc test signal with harmonics for checking RF, IF and AF circuits.

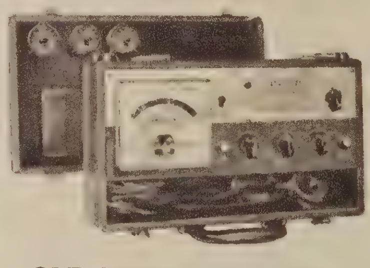
The KT-223 features a voltmeter useful for checking transistor radio batteries up to 12 volts and current drain up to 80 ma.

Complete with test leads and step-by-step instructions to make building this kit a pleasure. Attractive black case with anodized aluminium front panel.

New Stocks Arrived!

An exclusive LAFAYETTE publication. TRANSISTORISED MINIATURE AMPLIFIER AND TUNER APPLICATIONS. 96 pages of applications of the Lafayette transistorised miniature amplifiers and tuners.

BK-24 Post Paid $2.50



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15A WELLINGTON STREET,
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OCEANOGRAPHY

(Continued from page 12).

of the system is that it generat
sound signals, making counter-det
by a submarine's hydrophone i
sible.

The JULIE system employs
buoys equipped with hydrophone
radio transmitters in conjunction
explosives charges. Air-dropped
the search area, they relay under
echoes to the monitoring aircraft.

The listening ranges of these sy
vary with oceanographic condition
submarine tactics. Discriminatio
tween the varied underwater soun
still a thorny problem. Specialist
required who can depend upon
wide experience in listening to and
tifying underwater sounds. They
classify the raw data received as q
as possible—generally within a mat
minutes—so that it will be of ta
value.

The ever-increasing capabilitie
submarines as well as the limiting
tors due to physical and biological
nomena in the marine environment,
made it an ever-present necessity t
prove the capability of the airc
"ears in the sea."

An aid in overcoming some o
drawbacks, a 14-channel tape recor
the only one of its kind—has bee
veloped for the aircraft. It records
type of sound, whether from h
phones of other sources, includin
communication within the aircraft.
tapes have great value in training
sonnel to distinguish the various u
water sounds, but more than that
tapes furnish complete records of
an individual tactical exercise was
ducted. Post-exercise debriefings
held and comparative analyses ma
all of which provides valuable tra
for crew members.

Used in conjunction with the ac
cal systems are the MAD, ECM
radar systems. MAD is the acr
for Magnetic Anomaly Detector.
electromagnetic system is gauged t
earth's lines of magnetic force an
cords such magnetic deflections as
be caused by the metal hull of a
marine, provided the submarine is
operating at great depth. Once
target is located, the MAD system
pinpoint it for the attack. The sy
is advantageous in that it is pa
or non-radiating, and cannot be det
by submarines. However, the MAD
tem is rather limited in operat
range.

The Orion's ECM (Electronic Co
Measure) system is able to pick up r
transmissions from submarines a
means of locating them. Although
light-weight system has greater
capability than older systems of
kind, there is a continuing need to
prove its detection range and tha
other sensors carried by the aeroplan

Modern submarines can remain
merged most of the time but, when
ning on the surface they can be det
by the aircraft's radar, which is ca
of scanning in all directions. The
a disadvantage, however, in the fact
this radiation can alert the submarin

AMATEUR BAND NEWS AND NOTES

Ninth Jamboree-on-the-Air

The world-wide Scout Jamboree-on-the-Air will take place over the weekend of October 22nd and 23rd 1966.

By Pierce Healy, VK2APQ*

This annual event, held in collaboration h amateur radio operators throughout the rld, continues to grow in popularity. It been my pleasure, by courtesy of Noel nch, National Organiser for Australia of J.O.T.A. activities, to read the official ort on the 1965 event, compiled by the rld Scout Bureau in Ottawa, Canada.

Jntil reading the reports and seeing otographs of Scout groups from countries over the world, one does not fully realise interest and widespread active participa- n there is on the part of Scouts and ateurs alike. This fact bears out the rds of Brigadier A. E. Brown in his ech on the occasion of the opening of W.I.A. Remembrance Day Contest, also orted in these notes. (See page 137.)

jects:

To let Scouts and Guides talk to, or listen other Scouts and Guides—whether they in the next suburb, town, state, or in other country, and to learn about their ivities, their families and homes, and their untries.

les:

Amateur radio licence regulations must be strictly observed at all times. The passing of personal messages to a third party not present at either amateur station is not allowed, nor is the transmission of music or singing.

Any part of the 24-hour period may be used.

Any frequency band authorised for the amateur service in Australia may be used.

To take part, call "CQ JAMBOREE" or answer another station using this call. On CW, use the call "CQ JAM."

CW. AM. SSB or any other authorised mode of transmission may be used.

This is NOT a contest; there are no prizes given for the most contacts made.

mes for operation:

From 1000 hours Eastern Standard Time Saturday, October 22nd, to 1000 hours Monday, October 24th, 1966.

The Boy Scouts World Bureau station, 3WSB, located in Ottawa, Canada, will mmence operations at 0001 hours GMT Saturday and will close down at 2359 urs GMT on Sunday. At least three tions will operate simultaneously. De- nding on prevailing conditions, the follow- frequencies will be used.

10 metre band: 28.490MHz and .510MHz.

15 metre band: 21.195MHz and 21.350MHz.

20 metre band: 14.130MHz and 14.310 MHz (SSB) 14.020MHz (CW).

40 metre band: 7.190MHz and 7.290MHz (SSB) 7.020MHz (CW).

80 metre band: 3.790MHz and 3.805MHz (SSB) 3.510MHz (CW).

Operations will normally be on 20, 40 and 80 metre bands, transmitting on the first frequency shown. If using CW, (Morse code), it is suggested that the CW frequencies shown above be used to make the initial contact.

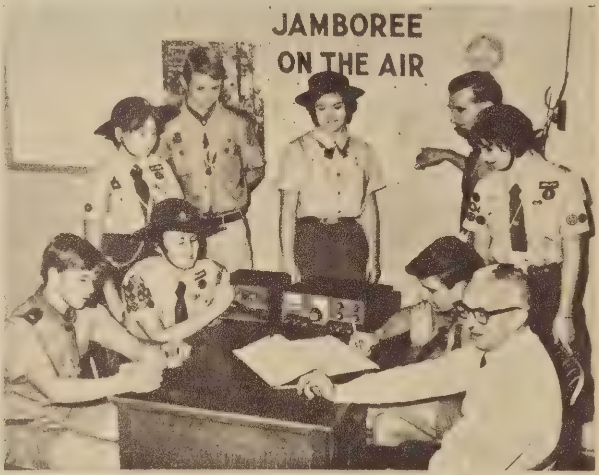
During the period of the Jamboree on the Air this year, the West Australian Division of the W.I.A. will man a station at the new Training Campsite—Manjedal, of the West Australian Branch of the Boy Scouts' Association.

This will be the first time that an official camp will be held at the site and contacts near and far will be sought to mark the occasion.

Official emblem of the Jamboree-on-the-Air.

Reports were received at the World Scout Bureau from 67 countries who participated in the 1965 Jamboree. In Australia, 400 amateur stations took part, this number being surpassed only Canada, with 430 stations.

The Headquarters Station, VE3WSB, had over 300 contacts to 32 countries during the 1965 J.O.T.A. including two contacts with Australian stations on the 20 metre band. It was also recorded that Australian and New Zealand stations could be heard at good strength on the 40 metre band, but due to the different frequency allocations in the two countries contacts were not made.



Preparing for the 1966 Jamboree-on-the-Air at VK4HQ the Qld. Boy Scout H.Q. amateur station. In the centre is the Qld. Liaison Guider responsible for organising the Girl Guide participation in the J.O.T.A.

The following 67 countries were recorded by the World Scout Bureau Headquarters Station VE3WSB at Ottawa, Canada, as participating in the 1965 Jamboree-on-the-Air.

Algeria
Argentina
Australia
Austria
Belguim
Bermuda
Brazil
Canada
Chile
Colombia
Congo
Costa Rica
Curacao
Denmark
Dominican Republic
Ecuador
Faeroe Islands
Finland
France
Germany
Great Britain
Northern Ireland
Gibraltar
Greece
Guatemala
Honduras
India
Iran
Ireland
Israel
Italy
Jamaica
Japan
Luxembourg
Madagascar
Maldive Islands
Mexico
Morocco
Mozambique
Netherlands
New Guinea
New Zealand
Nicaragua
Nigeria
Norway
Panama Republic
Paraguay
Peru
Philippines
Portugal
Rhodesia
St. Vincent
El Salvador
Singapore
South Africa
Sudan
Swaziland
Switzerland
Sweden
Trinidad
Uganda
U.S.A.
Prerto Rico
Alaska
Hawaii
Uruguay
Venezuela

* * *

lews and notes of Divisional and Club tivities submitted for inclusion in ese columns should be forwarded rect to Pierce Healy, 69 Taylor St., Bankstown, N.S.W.

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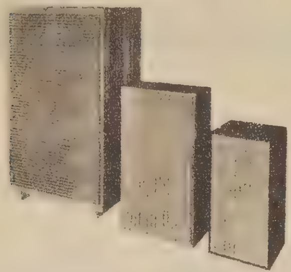

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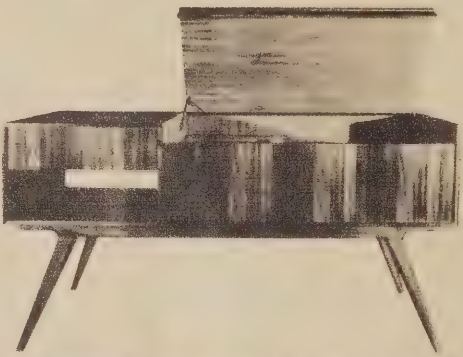

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TYPE **2N 706 A**

Silicon high frequency transistor for high speed switching. 27 Mc and 50 Mc power amplifiers. Mil spec. N.P.N. Silicon Vceo 15v 1 watt dissipation at 25° case.
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e keenness and enthusiasm of both s and amateurs who participated in are indicated by these extracts from of the reports recorded in the official t.

nada: "Some 430 stations took part all across the country and right up to a few hundred miles of the North The latter stations, with Eskimo Boy ts, were extremely popular."

lumbia: "A patrol of eight invaded an eur's shack. When they left, the patrol bered 10; the ham's two sons had d."

rmany: "The German-American Ama- Radio Club was extremely active, ating the full 48 hours with four sta- and 19 operators. Twenty-four coun- and 22 States were contacted."

eat Britain: "GB3BHP at Baden-Powell e had four stations operating for the 24 hours. G3UDN at Warwick, used a long wire antenna with one end nded from the Town Hall clock tower high. The Halifax Scout Station, VH, had an ingenious remote rotation ngement for the beam antenna, located distance from the shack. A Scout at the bottom, linked to the operator field telephone, and 18 overseas sta- were contacted."

n: "Iranian Scouting made careful pre- tions for this event, including holding nical courses in Morse code and elec- cs. An inovation was a special course English, to improve the participants' ersational ability over the air. A special on was established at a new Scout lquarters which was scheduled to be ed that weekend by Her Imperial esty the Queen of Iran. H.I.M., who a Girl Scout at one time, sent a message reeting over the air."

eland: "Twelve stations took part with roups representing all parts of Ireland. idea behind the J.O.T.A. was obviously erstood because three troops have now ed classes in Morse code and radio ry."

aly: "The 16th Milan (Handicapped) p were helped by 11RIF, made con- with nine countries ranging from den to Australia."

maica: "The Jamaican Amateur Radio ciation placed its station, 6Y5RA at the osal of the Scouts. Some 10 countries contacted during the 13 hours of ation."

orway: "The Explorers of Karmoy, an d off the rugged western coast of Nor- , set up LA5UJ in a cave on the island, ting a 40ft antenna on the cliff above. KJ, a 17-year-old scout with his own nce, operated his home-made SSB equip- t all night with the boys of his patrol, Notodden Troop."

ortugal: "For the first time, Portugal had ational Organiser for the J.O.T.A., and a result there was enthusiasm beyond ctations among both Scouts and ama- s. Blind Scouts of the 21st Lisbon up took an active part with eager rest."

weden: "Eleven stations with special call s were in operation. One of those in t demand was SM7XA/MM, operating n M/S "Sarpen," sailing along the st."

eylon: "A station operating under the sign 4S7RS was set up in the Scout dquarters. Contacts were made with 12 ntries. With the assistance of the Radio iety of Ceylon, it is hoped to establish a nanent station, with training facilities Scouts."

laldive Islands: "Scouting in these nds has been established for only a year o. Of the 135 Scouts and Cubs, 65 were orded as taking part from station MWA."

The origin of the Jamboree-on-the-Air goes back to 1957 when, during the Jubilee Jamboree held in England to celebrate the origin of Scouting some 50 years earlier, some radio amateurs among the Scouts got together and suggested that Scouts try to contact each other on a fixed day each year by means of amateur radio. Thus the idea of the Jamboree-on-the-Air was born.

Reviewing the progress made since 1957, Reverend James A. Stone, 72nd Dublin Troop, in summing up the results of the 1965 J.O.T.A. made these comments:

"It is difficult to evaluate the results of the past eight years and to see how far the objects have been attained. Many Scouts have obtained amateur radio licences as the result of the J.O.T.A. Many Scouting Associations throughout the world are introducing radio instruction classes.

"As a result of the Jamboree, many troops in widely separated parts of the world are continuing to exchange correspondence. We in the 72nd Dublin can bear witness to that point because some of the boys are still writing to fellow-Scouts in Sydney, Australia, to whom they spoke two years ago. Indeed there are many Australian badges to be seen in the Troop.

"This year we got some new ideas from the Hinds Scouts in Ashburton, New Zealand, to whom we spoke for 40 minutes.

"Scouts are lucky to find such a co-operative person as the radio amateur. Without the co-operation of the "hams" the J.O.T.A. would be impossible. Hams are very enthusiastic about their hobby and are always willing to put it at the disposal of anyone in any way they can. They have a world brotherhood also, and it is not unusal to find a round-table conversation going on between an Irishman, American, Australia, Russian and Swede.

"The Irish Scouts are lucky to have the Irish Radio Transmitters' Society so friendly disposed to them. With their help, and that is guaranteed at all times, there need be no limit to the achievements of the Scouts in their J.O.T.A.

"Such is the Jamboree-on-the-Air; not quite such a 'boisterous frolic, a spree' on the air but an annual occasion when Scouts are made aware in a practical manner of their World Brotherhood."

Amateurs who desire to make their services available during the weekend activities should either contact their local Scout Group or the Branch Headquarters of the Boy Scouts' Association in their State.

Portable or mobile operation from the Scouts own hall or camp site will find many willing helpers for the erection of antennas.

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The Electronic Multimeter 130S combines the versatility of the familiar multimeter with the sensitivity of the valve voltmeter. This meter has 58 ranges and is fully protected against overload. Mercury Batteries are used for power.

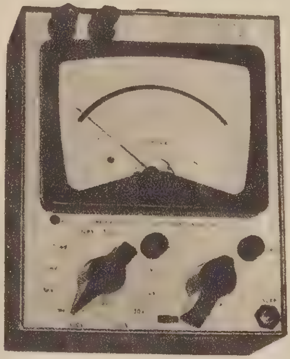
For all DC measurements a transistor-chopper amplifier with heavy feed-back provides input resistance of 1 Meg/Volt on voltage ranges. On AC the input resistance is 2 Megs on voltage ranges.

SPECIFICATIONS

Voltage: 0-10-30-100 300 mV } AC/DC
0-1-3-10-30-100-300-1.000 V } AC/DC
Current: 0-1 0.1uA A (DC): 0-10-10-100-100uA A: 0-1-10-100 mA (AC/DC)
Accuracy: DC 2%: AC 3%
Resistance: Linear (R. min.) 1-10-100 ohms: 1-10 Kohms
Reciprocal (R. max.) 10-100 Kohms: 1-10-100 megs
Accuracy: Linear 2% Reciprocal 5%
Response: To 1 Mc/s: Flat 20 c/s-100 Kc/s (AC)

PRICE: $164.00 Plus 12½% Sales Tax FOB/FOR Sydney

DC MILLIVOLTMETER 120S



The 120S is a robust portable multi-range DC unit designed primarily for low level signals but is equally suitable for general use due to its wide dynamic range. With an input resistance of 1 Meg/Volt the effect of connecting the 120S into a circuit may often be neglected. A one microamp (full scale) range is included.

SPECIFICATIONS

Voltage: 0-1-3-10-30-100 300 mV: 0-1-3-10-30-100-300 V
Current: Accuracy 2% current and voltage
0-1-10-100 uA A: 1-10-100 mA
Resistance: Linear (min.) 1-10-100-1,000-10,000 ohms
Reciprocal (max.) 10-100-1,000 Kohms: 10-100 megs
Accuracy: Linear 2% Reciprocal 5%
Recorder: Terminals provided for DC Recorder drive

PRICE: $135.00 Plus 12½% Sales Tax FOB/FOR Sydney

THERMOCOUPLE METER 160C/160F

A sensitive portable instrument for temperature measurement. All scales read directly when used with any of the thermo couples in common use. Errors due to lead resistance and non-linearity are eliminated electronically. A transistor-chopper DC amplifier gives high sensitivity, low drift and 1200 hours battery life.

SPECIFICATION RANGES

	160C (Centigrade)	160F (Fahrenheit)
Cr/Al Thermocouple	0-1000°	0-2500° (3000° range)
Fe/Con Thermocouple	0-700° (1000° range)	0-1600° (3000° range)
Cu/Con Thermocouple	0-300°	0-800° (1000° range)
mV 1 Meg/V	0-30° mV	0-30 mV
Accuracy	2% at 20° C. (Amb)	2% at 68°F. (Amb)
Variation	0.1% per °C.	0.05% per °F.
Wkg Range	0-40° C.	32-100 °F.

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WIRELESS INSTITUTE ACTIVITIES

1966-1967 edition of the Australian ur Radio Call Book is in course of printed. It is expected to be on sale end of October or early November.

s edition has been completely revised will be the same page size as the . magazine "Amateur Radio." In on to the call sign of Australian ur stations, it will contain details of cast and TV station frequencies, s and other useful information for urs and shortwave listeners.

price will be 75c per copy plus e where necessary. As only a limited er will be printed, orders should be l early with Divisional Secretaries in State.

AUSTRALIS 1

"VK-keyer" for the Australis satellite completed early in August and has gone continuous run tests successfully. major change in the design of the te has been made. The eight-channel etry will now be used to modulate the 144.050MHz and the 29.450MHz n.

the telemetry system switches the nitter on and off very rapidly, the drain will be cut by over 50 per thus allowing the HF transmitter to mmanded on for longer periods than riginally planned.

other change involves the replacement e magnetic coil attitude sensor with a sensitive horizon sensor. The telemetry rs will now comprise three photostors which will be used as attitude rs, two thermistors which will relay satellite's internal temperature, one y current and one battery capacity r.

EURO-OSCAR

e Euro-Oscar satellite which is being under the direction of DJ4ZG, is ted to be delivered to the Oscar quarters within the next few weeks. satellite will be very similar to r III. It will have a 2 metre to 2 metre ter on board.

e receiver will accept signals in the -pass 144.05MHz-144.15MHz and relay on 144.85MHz-144.95MHz.

NEW SOUTH WALES DIVISION

embers and visitors attending the st meeting of the New South Wales ion were treated to a most interesting enlightening lecture.

e lecturer, Trevor Andrews, of Fairchild ralia Pty. Ltd., spoke on "Integrated its, past, present and future."

clearly explaining the Planar process howed how it is possible to produce rated circuits on a chip of pure silicon square, and up to 150 transistors on ame area.

was also pointed out that e developments in the semiconductor may make it possible to build a lete radio receiver using a series of ocircuits.

was an interesting lecture which showed amazing progress made in the electronic during the last five years.

e monthly meeting of the N.S.W. Divi- is held on the 4th Friday of each th at W.I.C., Crow's Nest.

WICEN NOTES

ter Campbell, VK2AXJ, WICEN Pub- Officer for the New South Wales sion has received many inquiries as to net frequencies used by WICEN and crystal frequencies required to put the us makes and models of carphones on /HF net frequencies.

e following tables set out the details:

Frequencies:
tres: Channel A 145.854MHz
Channel B 146,000MHz.
Channel C 146.100MHz
e—FM ± 15KHz peak deviation.

tres; Channel A 53.920MHz
Channel B 53.950MHz
le: FM ± 15KHz peak deviation.

Channel 1 53.786MHz
Channel 2 53.826MHz
Channel 3 53.866MHz
Mode: Amplitude modulation.

Crystal Frequencies:
2 metres:

Channel	Transmitter	Receiver
A	4051.500KHz	10275.285KHz
B	4055.550KHz	10285.714KHz
C	4058.302KHz	10292.855KHz

The above are for AWA type units MR's 3a; 3b; 10b; 10c; 20a; 20b with a 30pF shunt capacitor. For MR10a, double crystal frequency in the receiver only.

For the TCA type 1649 with 30pF shunt capacitor use:

A	as above	28770.8KHz
B	as above	28800.0KHz
C	as above	28820.0KHz

For the TCA type 1674 with 30pF shunt capacitor use:

A	as above	21122.00KHz
B	as above	21142.85KHz
C	as above	21157.14KHz

For STC type MR2A use:

A	as above	20593.428KHz
B	as above	20614.285KHz
C	as above	20628.571KHz

For STC type MTR 121D with 20pF series capacitor use:

A	6077.250KHz	15783.77KHz
B	6083.333KHz	15800.00KHz
C	6087.500KHz	15811.11KHz

6 metres—For AWA low band types as above use:

A	2246.666KHz	11184.0KHz
B	2247.916KHz	11190.0KHz

For STC type MR2A use:

A	as above	17406.06KHz
B	as above	17416.66KHz

It should be noted that if modifying a low-band 70-85MHz AWA unit for 146MHz the crystal frequency shown above should be used and not a 20MHz crystal.

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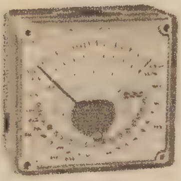
SANWA MULTITESTER MODEL F-7TR



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For accuracy, reliability and versatility choose SANWA and get unsurpassed tester performance.
MODEL F7TR. The unique range selector is really epoch-making, a red ball appearing in the slot on a clear acrylic dial. Half in size compared with conventional testers. The meter self-checks the internal batteries.

Measurement Ranges:
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OHM: RX1, RX10, RX100, 50M. (Min. 1 ohm and max. 50mg ohm).
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LI: 20, 2, 0.2ma.
Batteries: 1.5v (UM-3) x 1 and 22.5v (BL-015) x 1.
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PORTABLE RADIOGRAM

7 TRANSISTORS

- ★ Plays all 33 and 45 r.p.m. records.
- ★ Powerful Radio Reception.
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SIZE 9in x 10in x 3in.
Weight 3¼lb.

$39.95 plus freight 25c.

SILICON DIODES post free

IN3491 18 amps at 50 P.I.V. available with either K or A to Case	95c
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NEW SIDAC (Silicon Symmetrical Diode)

The SIDAC is a five layer semi-conductor device (NPNPN) having two terminals greatly simplifying AC control circuits. Being Bi-directional, one SIDAC can replace two SCR's in conventional control systems. In addition, blocking voltages are less temperature sensitive in the SIDAC and since there is reverse direction, voltage transients do not injure the device. Current surges also are less damaging than those encountered in SCR's as the current is not initially confined to a small area near a gate. The SIDAC is cheaper than comparable SCR's. Firing the SIDAC is simplicity itself. Either a parallel or series circuit may be used and specially developed pulse diode is available with suitable pulse transformer.

TYPE K5B20—Normal A.C. (R.M.S.)
Circuit Voltage — 240 — R.M.S.
Current Capacity — 5 amps. .. **$4.25**
PULSE DIODE type K2C .. **$1.00**
PULSE-TRANSFORMER **$1.50**

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NOTE: A circuit is available for making a 1,000 watt Light Dimmer using the K5B20, K2C, Pulse transformer and a few resistors and condensers. Write or Call for a copy.

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Any of above plus 25c freight Write or call for Free Literature o these and other Rota products.

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Famous 1-dollar paks — branc new — no "rubbish." Ideal fo amateurs, beginners, servicemen enthusiasts.

1	30 carbon resistors, asst. ½ wat and 1 watt, presets too.	$1
2	20 asst. capacitors, 5 each paper, plastic, mica, ceramic.	$1
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5	100 Assorted Rubber Grommetts.	$1.
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Guaranteed A1 quality. Popular brands. 1 pak, postage 4c (5d), 3 paks, post free.

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Will fit Australian type Mic. Stands. Attractive white plastic case and supplied in box with 7½ feet cable and phone plug.

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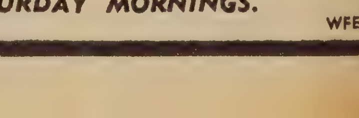

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WFE/8

ystals should be in type 'D' holders 5 per cent or better. FT243 type are not satisfactory because of ture drift.

ications necessary for Pye AM units been previously described in RONICS Australia and the W.I.A. e "Amateur Radio."

has been a great deal more activity WICEN net frequency in the New- nd Central Coast areas since the ort. Phil Levenspiel, VK2TX and earsall, VK2ASA in the Wyong area ined the net. Conditions between and Newcastle appear to be ideal ood signal reports have been ed between VK2AWX, the Hunter station at Teralba, and the Central ations around Gosford.

the activity promised, it looks as will soon be many more stations g on the 146MHz frequency in the ure.

w base-station transmitter has been at the N.S.W. division's station at Dural which has enabled 100 t communication to be established Sydney and Newcastle on the net frequency.

VHF GROUP

of the most interesting in the current f lectures given at the V.H.F. Group was that at the August meeting nel Dooland, VK2ZLD.

lecture described and demonstrated ious techniques used in the design hing of printed circuit boards. Lionel cturer at the Gore Hill Technical and his expert presentation of this technique in construction of radio ent was very much appreciated by ience.

meetings of the V.H.F. and T.V. of the N.S.W. Division of the W.I.A. d on the first Friday of each month Wireless Institute Centre, 14 Atchison Crows Nest, commencing at 8 p.m. vision has an interesting program of and night contests which are held out the year. Points are allocated contestants who attend and subse- fill the first three places in these s. The member with the greatest ag- score at the end of the year is pre- with the Chairman's Trophy.

bership of the Group is open to all rs of the Division; no additional fees rged.

HUNTER BRANCH

August meeting of the Hunter Branch dressed by Dave King, VK2ZFR, a ian at the Williamtown Air Force

displayed and described the com- voice radio equipment used on some modern aircraft in service with the F. He carefully went through the cir- nd described in some detail the features of the unit, especially in to channel switching and frequency y.

as interesting to note that, although lio equipment shown was the most type, a genemotor was used to power for the high tension supply. ntly there is still some hope for the genemotor in this age of transistors.

next meeting of the Hunter Branch e held in Room 6 of the Clegg g at the Technical College, Tighes n Friday, 4th November, 1966. The will commence at 8 p.m. and an ing lecture has been arranged. s are welcome.

Fairhall, VK2KB, who has not ctive for many years, has at last time to get back on the air and ing a fine signal out on 14MHz. legant rotary beam is a prominent rk in the Bar Beach area.

her oldtimer to recently make his arance on the bands was John Traill, , who was heard going hammer ngs during the Remembrance Day t.

y of the Hunter Branch stations pated in the contest and among ghest scorers was Geoff Hunziker, VK2BGF. Tony Mullen, VK2ZCT, also did well in the VHF section of the contest and looks to be in a winning position. Among the short-wave listeners, Paul Linsley made an excellent score. The Branch's most recent successful candidate for the Full Call qualifications is Milton Cairn, who was anxiously awaiting the issue of his call-sign.

CENTRAL COAST BRANCH

A very lively and interesting talk was given to members of the Central Coast Branch by Dave Andrews, VK2AWZ, at the August meeting. Attendance totalled 27, including some visitors from Newcastle and Sydney.

Dave's subject was "Fox hunting," not the kind which requires the use of horses and hounds, but the kind which in amateur parlance refers to the art of locating hidden transmitters.

Those present were given many useful hints on the methods that can be used and equipment which has been proved to be most suitable for the purpose of locating the elusive "fox." Dave is very well versed in the art and has an outstanding record of success in these contests.

The 144MHz converter project is still attracting a good deal of interest and several members have completed their units.

Overseas trips by members of the Branch are in the news at present. Ernie Hodgkins, VK2EH, has made a trip around the South Pacific, while Phil Levenspiel, VK2TX, is on a very extended trip around the world, one of the highlights being an overland coach trip from India to London.

Visitors are always welcome to the meetings of the Central Coast Branch, held in the School of Arts, Gosford, on the third Friday of each month.

WAGGA RADIO CLUB

A Radio Club has been formed at Wagga Wagga. The initial meeting was held to organise for the running of the South-West Zone Convention. Following this, the club will provide classes in radio theory and Morse code for those interested in gaining their A.O.C.P.

The officers appointed to co-ordinate the initial activities are:—

President: Sid Ward, VK2SW.
Secretary-Treasurer: Jim Edge, VK2AJO.

All inquiries should be made to the Secretary, J. W. S. Edge, Wallace Street, Coolamon.

WEST AUSTRALIAN DIVISION

At the Annual Meeting of the West Australian VHF Group the following members were elected as officers for 1966-1967.

Patron: F. W. Dawson.
President: D. E. Graham, VK6HK.
Vice-President: R. B. Pemberton, VK6VW.
Secretary: R. K. Graham, VK6ZDS.
Bulletin Publication:
  Editor: J. P. Hughes, VK6ZEK.
  Technical Notes: C. J. Kosino, VK6LK.
QSL Officer: L. Jessop, VK6ZEA.
Committee Members: C. J. Kosina, VK6LK; R. Chamberlain, VK6RY; H. Pride, VK6HP.
Broadcasts: G. Sturcke, VK6ZEZ.
Oscar Coordinators: R. Chamberlain, VK6RY; D. E. Graham, VK6HK.
VHF Records: C. J. Kosina, VK6LK.
Librarian: R. J. Everingham, VK6BO.
Program Director: T. C. Berg, VK6ZAF.
Trustees: R. H. Mould, VK6FM; S. J. Smith, VK6SJ.

In his report on the past year's activities, the retiring President, H. Pride, VK6HP, commented on the necessity to use the whole of the VHF bands and not restrict the activities to mobile and fixed station FM net frequency.

Comment was also made on the achievements of Don Graham, VK6HK, in receiving pictures from the Essa II weather satellite.

The Group meets on the fourth Monday in each month at the D.C.A. Workshop Canteen, 86 Guildford Road, Maylands, at 8pm. Visitors are welcome.

The General meeting of the Division is held on the third Tuesday of each month at the Perth Technical College. Proceedings commence at 8pm, and visitors are always welcome.

TASMANIAN DIVISION

VHF activity along the northern coast of Tasmania is revealing some interesting facts in relation to VHF propagation. Mid-winter contacts across Bass Strait to Victoria on 144MHz, although still called unexpected openings, may in future be found to follow some definite pattern.

On June 29 the 144MHz opening to Victoria produced some particularly good signals and it is reported that contacts were made by VK7ZLX, VK7LZ, VK7ZAH, VK7ZAA, VK7ZBW, VK7ZBE and VK7BR.

CRYSTAL DIVISION

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	Amateur Net (each, includes Tax.)
● 1.8 MHz to 14.999 MHz ± .005% In Style "D" Holders, ½in. pin spacing.	$4.85
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Many other types and tolerances are available from our standard production. Please consult us on your Crystal requirements.

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Perth:	151-155 Brisbane Street, Perth	28-4338
Hobart:	141 Murray Street, Hobart	3-3707

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"SUNRICH" PORTABLE 5 TRANSISTOR TAPE RECORDER

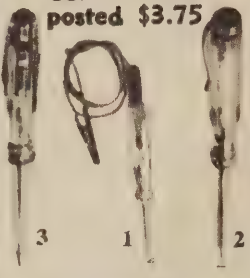
Model 999A $31.50 (£15/15/-)

Plus post., 75c.

Reduced from £22/10/
Complete with Tape, Battery, Phone and Mike

SPECIAL PURCHASE

Set of three posted $3.75



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German screwdriver and pocket tester.

1. 6-12 volt model auto tester.
2. Sparkplug tester.
3. 110-380 Volt mains tester.

$1.25 each

MULTIMETER TESTERS

Model RH-50

Modern Design, 33 Micro Amp Meter.

30,000 Ohms per Volt D.C.

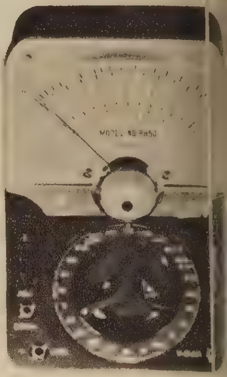
13,000 Ohms per Volt A.C.

1 p.c. Multipliers and Shunts used. Printed circuit.

Clear Scale, rugged moulded case.

SPECIFICATIONS

DC Voltages: 0-0.3-1.2-3-12-30-120-300-600-1,200 V at 30,000 Ohms per volt.
AC Voltages: 0-3-12-30-120-300-600-1,200 V at 13,000 Ohms per volt.
DC Current: 0-.06-6-60-600 mA, 0-12 A.
Resistance: 0-60K-6M-60M (350, 35K, 350K at mid-scale).
Decibels: minus 20 to plus 57 dB (0 dB equals 1 mW. 600 ohms).
Audio Out: Capacitor in series with AC volt ranges.
Short Test: Internal buzzer.
Accessory: 1 pr. heavy test leads.



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Batteries: 1 (1.5V), 1 (1
Size: 3 5-16" x 6 5-16" x
Weight: 1.4lb approx.

LIMITED STOCK ONLY

Model RH-10

RANGES:

DC Voltages: 0-10-50-500-1,000 V at 2,000 Ohms V.
AC Voltages: 0-10-50-500-1,000 V at 2,000 Ohms V.
DC Current: 0-500uA 0-500 mA.
Resistance: 0-10K-1Meg: 60 ohms, 6K ohms at centre scale. scale.
Capacitance: 250uuF to 1uF, in two ranges.
Decibels:—20 to plus 36db, two ranges.
Output: 0-1,000 V in four ranges.
Size: 5in x 3½in x 1½in.
Weight: 13oz approx.

Price $10.75 (£5/7/6)

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MODEL RH.31

MODEL RH-31

- 20,000Ohms per Volt on D
- 10,000 Ohms per Volts on A
- 3½" Meter.
- 18 position selector.

SPECIFICATIONS:

DC Voltages: 0-5-25-100-500-10 5000 (20,000 Ohms/V).
AC Voltages: 0-5-25-100-500-1 V (10,000 Ohms/Volt).
DC Current: 0-50 uA, 0-5- 500mA.
Resistance: 0-6K-600K, 0-6M 60Meg.
(30) Ohms, 3K, 30K, 440K centre scale).
Capacitance: 100uuF-0.01 0.002uF-0.3uF.
Inductance: 20 H to 2000 H.
Decibels: minus 20db to pl 30db in 2 ranges.
Output Jack: for Au measurements.
Dimensions: (3¾" x 5¾" x 2 3-8
Weight: (23oz approx.)
Complete with internal batte and testing leads with pro

$24.50

Postage 50c to $1 extra.

TRANSISTOR HEARING AID

First Phone Model 3 Transistors

This Hearing Aid is an ultra-modern unit. It incorporates the folowing outstanding features:
Ample power and clear tone.
Compact, smaller than a packet of cigarettes.
Precision printed circuit design.
Magnetic earphone.
Separate Tone and Volume Controls.
Battery used: UM5 dry cell.

Packed in a presentation case.

New Model $31.50

Replacement Battery only 12c.
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MODEL TP-5 POCKET VOM. TESTER

RANGES:

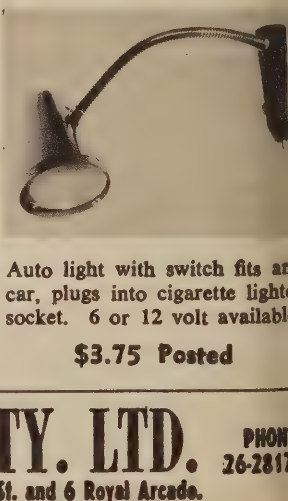
- DC Voltage: 2,000 OHMS per VOLT 0-5-25-100-250-1000 Volts.
- AC Voltage: 2,000 OHMS per VOLT 0 - 5 - 25-100-250-1000 Volts.
- DC Current: 0-500uA, 25uA, 500mA.
- Resistance: 0-20K, 0-2Mg. OHMS.
- Capacitance: 500uuF to 0.1uF at 100V AC. 0.01uF to 2uF at 5V AC.
- Decibels: minus 20 DB to plus 48DB in 5 ranges.

RX10
TP-5 TMK TESTER

£5-17-6

$11.75

CAR, CARAVAN LIGHT FITTING



Auto light with switch fits an car, plugs into cigarette light socket. 6 or 12 volt availabl

$3.75 Posted

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QUEENSLAND DIVISION

e August edition of the Queensland ion monthly Bulletin "Q.T.C." took on w look. The front cover carried an tisement for Mullard-Australia, which o doubt prove to be of mutual advantage to both the company and members of istitute.

thought-provoking editorial by the dent, Lawrie Blagbrough, VK4ZGL, amateurs to investigate propagation omena, particularly on the VHF bands will no doubt give VHF operators some- to consider during the coming sum- nonths.

LOELA AMATEUR RADIO CLUB

new club, The Biloela Amateur Radio , has been formed in that town, 77 south-west of Gladstone. Although han three months old, there are already nembers attending the A.O.C.P. course h is conducted each Sunday evening at .

ficers of the Club are:

esident: Doug Price, VK4PG/T.
ce-President: Len Coyle, VK4LL.
on. Secretary: Mrs Val Williams.
on. Treasurer: Don Blanch.
isposals Officer: Dave McLean.
orrespondent: Adrian Williams.

e Biloela Club has adopted, with minor ifications, the constitution of the Bunda- Amateur Radio Club. Both clubs have oined to hold very successful field days. e objectives of the Club include the g up of club rooms with a club station, rary and other facilities for members.

urther information can be obtained by ing to: Hon. Secretary, Biloela Amateur io Club, P.O. Box 365, Biloela, Queens- .

I.A.R.C.

ention was made in last months notes the International Amateur Radio Club ted in Geneva, which operates under call sign 4U1ITU. Members in the club mainly amateurs associated with the ous delegations and staff attached to the rnational Telecommunication Union.

he call signs of the office bearers for indicate the international atmosphere exists in the club.

onorary President: John H. Gayer, AEQ.
resident: Dr Miroslav Joachim, OK1WI.
ice-President: (Pending).
ecretary: Ted Robinson, F8RU.
reasurer: Heinz Robig, HB9QC.
tation Manager: Gunter Joraschkewitz, 9UD.
tation Engineer: Igor Dolezel, OK1FY.
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wards Manager: N. V. Gadadhar, 2GN.
cientific Adviser: Willi Menzel, 9AAB.

I.T.U.

he XIth Plenary Assembly of the Inter- ional Radio Consultative Committee C.I.R.) of the International Telecom- nication Union (I.T.U.) was held from e 22 to July 22, 1966.

n its 15 specialised study groups, the sembly reviewed the progress achieved in entire field of radio and approved the vant documents. It considered the ad- ces in space communications which de possible the introduction of regular io service by means of U.S. and U.S.S.R. ellites.

(Continued on Page 139)

1966 REMEMBRANCE DAY CONTEST

From the activity observed on the amateur bands during the period of Remembrance Day Contest, it would appear that the 1966 contest was an outstanding success.

The contest was officially opened by a recorded speech transmitted from all official stations of the Wireless Institute of Australia.

The speaker was Brigadier A. E. Brown, C.M.G., O.B.E., Director of the Pacific Region of the Commonwealth Graves Commission, who was introduced by the Federal President of the W.I.A., Max Hull, VK3ZS.

Brigadier Brown said: "As an officer who in war and in peace learned to depend so much on communications, it is a very great privilege for me to speak on the occasion of the opening of the Wireless Institute of Australia's Remembrance Day Contest for 1966.

"Those who served in World War II cannot have anything but the most profound admiration for the 'sigs' of all services. I particularly recall the magnificent work of the air wireless warning groups, of the men and women of the coast watcher service whose only contact with the outside world was by means of radio, of the 'sigs' who were in the forefront of every action in the western desert, and of the wireless operators who served far behind the enemy lines passing vital information. Most of all I pay tribute to those who did not return.

"We are faced today with the challenging task of recalling the sacrifice of those whose lives were cut short in war. Those who survived must not forget what that sacrifice of life meant to the individual and those who held him dear.

"The memory of even the greatest deeds tend to fade with time. There is coming about more and more a lack of knowledge and appreciation of what has taken place even in World War II.

"Acts of commemoration are not mere homage to the past, such acts are part of our duty to ensure that those great sacrifices were not made in vain. By those sacrifices, nations throughout the world have been and are being brought closer together.

"The lessons of service which were so great a part of the lives of all Servicemen have found a parallel in the efforts of the Amateur Transmitting Service of Australia. Our hams are carrying on the task left unfinished by two world wars, of constantly working for world peace. Perhaps in their daily lives they were unaware of the importance of their efforts.

"Throughout the world the amateur radio operators are slowly but surely bringing about a better understanding between nations and peoples.

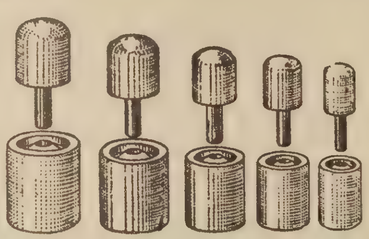
"The scientific achievements in the field of radio and communication have been tremendous. The ham has not only kept pace with those developments, but in many ways has directly contributed to them. In that field alone their existence could be justified, but their efforts in that direction is only a small part of their value to the community and to the world.

"There are few fields of community service which surpass the work of the radio ham in times of disaster. Fire, floods and earthquakes demand speedy communication systems, and, it is here that the ham has so often and so adequately demonstrated his value.

"In the international field the ham is doing his part with equal effect. Through their efforts the world of communication is growing smaller and closer. A common bond exists between amateurs of many countries and is creating a better understanding between peoples.

"It is with very great pleasure that I declare open the 1966 Remembrance Day Contest of the Wireless Institute of Aust."

WILLIS
HAMMER DIE PUNCHES



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7/16in	2.40	1-1/16in	4.00	1⅝in	6.40	2-5/16in	9.60
½in	2.60	1-⅛in	4.00	1¾in	7.20	2⅜in	10.40
⅝in	2.60	1-3/16in	5.00	1⅞in	8.00	2½in	11.00
11/16in	2.80	1¼in	5.20	2in	8.40	2¾in	12.40
¾in	3.00	1-5/16in	5.20	2-1/16in	8.60	3in	13.40
13/16in	3.20	1⅜in	5.60	2⅛in	9.00	3¼in	15.80
⅞in	3.80	1-7/16in	5.80	2-3/16in	9.40	3½in	18.20

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foster®

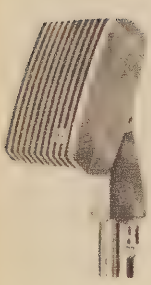
dynamic microphones

*MDF-600B cardioid microphone

SPECIFICATIONS
Impedance : 50 kΩ
Frequency Response : 100~10,000 c/s±8 dB
†Sensitivity : −52 dB±3 dB,
Dimensions : 148×48×34.5 mm without stand
Cable : 4 φmm, 3 m
Weight : 1¼ lbs (525 g)

DF-1DE

SPECIFICATIONS
Impedance : 50 kΩ
Frequency Response : 150~10,000 c/s±8 dB
†Sensitivity : −57 dB±3 dB,
Dimensions : 385.5 mm high
21 mm diameter, microphone
128 mm diameter, stand
Cable : 4 φmm, 1.5 m
Weight : 1⅝ lbs (840 g) with cable



*DF-14B

SPECIFICATIONS
Impedance : 50 kΩ Variable
Frequency Response : 100~10,000 c/s±8 dB
†Sensitivity : −48 dB±3 dB,
Dimensions : 136×75×47 mm
Cable : 6 φmm, 4 m
Weight : 2 lbs (900 g)

*DF-22B

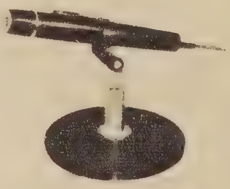
SPECIFICATIONS
Impedance : 50 kΩ
Frequency Response : 50~12,000 c/s±7 dB
†Sensitivity : −57 dB±3 dB,
Dimensions : 32.5 mm diameter, 220 mm long
Cable : 6 φmm, 4 m
Weight : 1¼ lbs (575 g)

DF-1/*DF-1B

SPECIFICATIONS
Impedance : 50 kΩ
Frequency Response : 100~10,000 c/s±8 dB
†Sensitivity : −57 dB±3 dB,
Dimensions : 21 mm diameter, 82.7 mm long
Cable : 3 φmm, 1.5 m
Weight : 3.9 oz (110 g) with cable

DF-3

SPECIFICATIONS
Impedance : 50 kΩ
Frequency Response : 50~12,000 c/s±8 dB
†Sensitivity : −56 dB±3 dB,
Dimensions : 33.5 mm diameter, 133 mm lon
Cable : 4 φmm, 1.5 m
Weight : 9.0 oz (255 g) with cable



DF-12/*DF-12B

SPECIFICATIONS
Impedance : 50 kΩ
Frequency Response : 80~12,000 c/s±8 dB
†Sensitivity : −57 dB±3 dB,
Dimensions : 23 mm diameter, 158 mm long
Cable : 3 φmm, 1.5 m
Weight : 6.3 oz (180 g) with cable

*DF-2B

SPECIFICATIONS
Impedance : 50 kΩ
Frequency Response : 100~10,000 c/s±10 dB
†Sensitivity : −56 dB±3 dB,
Dimensions : 75×53×30 mm
Cable : 3 φmm, 1.5 m
Weight : 4.8 oz (136 g) with cable

*DF-51B

SPECIFICATIONS
Impedance : 50 kΩ
Frequency Response : 150~8,000 c/s±7 dB
†Sensitivity : −57 dB±3 dB,
Dimensions : 98×58×36 mm
Cable : 6 φmm, 1.6 m, Coiled
Weight : 7.3 oz (207 g) with cable

* with switch : † at 1,000 c/s, 0 dB=1 V/μ bar

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AGENTS:
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S.A.: Neil Muller Pty. Ltd., 8 Arthur St., UNLEY.
N.S.W.: Jacoby, Mitchell & Co., 469-475 Kent St., SYDNEY.
TAS.: Homecrafts-Tasmania, 199 Collins St., HOBART.
Nichols Radio, 91 Wellington St., LAUNCESTON.
QLD.: T. H. Martin Pty. Ltd., 35 Charlotte St., BRISBANE.
N.Z.: P. H. Rothchild, 83 Pretoria St., LOWER HUTT.

eport was prepared describing the colour television systems now ing or under study as a result of the bly's efforts in this field, namely, SECAM III, PAL and SECAM IV. unately, it was not possible to issue ommendation advocating the use of articular system throughout the world Europe.

the field of radio propagation, the g approved an atlas of world heric characteristics prepared by of electronic computers.

preparation for the African MF/LF casting Conference to be held in nber 1966, the Assembly approved showing the bases for calculating F propagation in the African Region. mendations on the protection ratios IF/LF broadcasting will be used at onference.

question of band sharing between communication systems and earth relay systems was thoroughly cond.

conference approved a recommendaon VHF stereophonic broadcasting rds. To meet the requirements of new veloping countries, the meeting decided number of manuals should be preto assist technicians in those coun- One of the manuals will deal with al broadcasting.

preparation for the Extraordinary nistrative Maritime Radio Conference 67, the Assembly adopted decisions e intensification of studies concerning se of single-side-band techniques for urposes of the maritime services. A on on a selective calling system to be for maritime communication was ed to permit the development of new ns.

accordance with the International ommunication Convention held in reux in 1965, the Assembly elected Mr Herbstreit, of the U.S.A., as Director e C.C.I.R. for a period of six years. ucceeds Mr Leslie W. Hayes, who is ng after 17 years' service in the .R. Secretariat.

AN INVITATION

b Secretaries or Publicity Officers of clubs throughout Australia and New nd are invited to send details of their activities to the author of these notes. postal address to which intending mem- should write, particulars of meeting s, dates and times should also be .

ny inquiries are received for such nation from persons wishing to take mateur radio or visit a radio club g holiday trips. Knowledge of such s for publication will quite often per- a service to amateur radio, radio clubs nquirers alike.

MEDICO'S NOTE

inaugural meeting has been held of 'Medical Amateur Radio Society" in J.S.A. The office bearers were:-

sident: WAIFMY.

sident-Elect: K2JVA.

asurer: W2KDI.

retary: WA6CRN.

is organisation is hoping to create terest among doctor-amateurs both in J.S.A. and also abroad. Members of edical profession interested in joining d contact. William L. Sprague, M.D., North 4th Street, Montebello, Calia, U.S.A.

VALE

is with deep regret that we record eath of Vic Holmes, VK2AKP, who on August 26th after a short illness. st licensed in Glen Innes over 30 ago, Vic helped to locate an illegal mitter in the Moree district during d War II. In 1949 he again gave service maintaining communications between and and Waratah during the disastrous s in the Hunter Valley.

e deepest sympathy of his friends in amateur service is extended to his y in their sad bereavement.

W.I.A. YOUTH RADIO SCHEME

Attention of advanced Y.R.S. groups and members who have advanced to the higher certificate grades, is drawn to the Australis project.

With the first Australian amateur-built earth satellite nearing completion, it is suggested that some thought be given to actively participating in the project by tracking the satellite and submitting reports on observations made.

The satellite is being built by members of the Melbourne University Astronautical Society and the Melbourne Amateur Radio Club.

Equipment required for tracking purposes consists of a 144MHz or 29MHz converter in conjunction with a short-wave receiver, and a helical antenna of right-hand circular polarisation, suitable for the frequency used.

VK3RA
VK3LC

Two members of the Steadfast Radio Club and the club station transmitter VK2BBB (Bankstown Boys' Brigade).

Details for the construction of converters and helican antenna are given in amateur radio handbooks. As launching date approaches, details of identification and telemetry signals will be published, as well as the form in which reports should be submitted.

As the success of any space experiment depends on the reports from ground stations, it is hoped that a number of Y.R.S. Groups will be submitting reports.

THE STEADFAST RADIO CLUB

The Steadfast Radio Club, located at Bankstown, in the Western Suburbs of Sydney, was formed in December, 1965. Since then this Y.R.S. Club has shown many signs of advancement both among its members and its activities.

The club has toured around N.S.W. and into Queensland, visiting VK2BCP; VK4JR; VK4LI and VK4WS. Visits have also been made to several of the Sydney amateur stations as well as to commercial enterprises.

The Club's own transmitter, VK2BBB, has been a valuable asset in training members in operating procedure and has not only created interest in obtaining W.I.A. Y.R.S. certificates but the more coveted prize, the A.O.C.P.

One of the most interesting clubs associated with the Y.R.S. is the one recently formed at the Mittagong Training School for Boys.

The Club is conducted by the Resident Psychologist, Mr S. Hastleton. It is thought that introducing an interesting hobby, such as radio, can do much to help the boys in the school.

Several very good donations of radio parts have been received and acknowledged with appreciation by the Supervisor of the Y.R.S., Rex Black, VK2YA.

Mr New, of General Accessories Pty. Ltd Concord, N.S.W., has made available an electronics kit marketed under the trade name "Genacs."

Mr Ron Schonrock arranged for a large quantity of "Multiflash" Cards, each containing three transistors, from the Amalgamated Wireless Valve Company. Mr Schonrock also expressed his appreciation for the large number of letters he has received from Club Leaders and members.

Commonwealth Electronics Pty. Ltd., of Brookvale, N.S.W., have made available a quantity of useful radio components.

Mr Milton Moore, VK2LI, of the School of Electronics, North Sydney Technical College, also donated a large quantity of useful components.

ONLY £55

Exactly as illustrated here, few only: add freight for country.

300 POWER REFLECTOR

This astronomical reflector boasts a spherical 4½in aluminised mirror that resolves to one second. More exacting colour definition . . . far better corrections of chromatic aberration than can be found in most refractor-type scopes. Sharp focusing of stars through twelfth magnitude. Complete equatorial mount with double indexing system. Flexible slow-motion controls for easy location and tracking. Accepts clock drive accessory. Attractively gift boxed.

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MICROSCOPES FROM £8 TO £250.

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K 20 CT330 **K 20** CT500

220S 4000 O.P.V.

D.C. Volts 5, 25, 125, 500, 2500. A.C. Volts 10, 50, 250, 1000. Current: 250uA, 250mA. Resistance: 0-10K, 0.1 Meg.

£3/19/6 Post 5/-

C.T.330 20K.OPV

D.C. Volts, 6, 6, 30, 120, 600, 1200. 3000, 6000. A.C. Volts, 6, 30, 120, 600, 1200. D.C. Current, .06-6, 60, 600mA. Resistance, 6K, 600K, 6meg. 60meg. D.B. minus 20 to plus 62. 5 Ranges. Specially suitable for transistor use. **$15.95** Post., 50c.

C.T.500 20K.OPV

D.C. Volts, 2.5, 10. 50. 250, 500, 1000. A.C. Volts, 10, 50, 250, 500, 1000. D.C. Current, .05, 5.50, 500mA. Resistance. 12K, 120K, 1.2 meg., 12meg. D.B. minus 20 to plus 62.

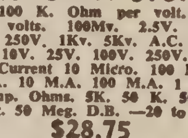
$13.25 Post., 50c.

KAMODEN 370N

100 K. Ohm per volt.
D.C. volts. 100Mv. 2.5V. 10V. 100V. 250V. 1Kv. 5Kv. A.C. volts. 2.5V. 10V. 25V. 100V. 250V. 1Kv. D.C. Current 10 Micro. 100 Micro. 1 M.A. 10 M.A. 100 M.A. 1 Amp. 10 Amp. Ohms. 5K. 50 K. 500 K. 5 Meg. 50 Meg. D.B. —20 to +62.

$28.75

Post N.S.W., 75c; Interstate $1.50.



P.T.34 1000.OPV

D.C. Volts, 0, 10, 50, 250, 500, 1000.
A.C. Volts, 0, 10, 50, 250, 500, 1000.
M.A. 1-100-500 RESISTANCE.

$5.25 Post., 50c.

200H. 20K.OPV

D.C. Volts, 5, 25, 50, 250, 500, 2500. A.C. Volts, 10, 50, 100, 500, 1000. D.C. Current, 50uA, 2.5, 250mA. Resistance, 6K, 600K. Capacitance, 2 D.B. Ranges.

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T.E. 40. V.T.V.M. MILLIVOLTER

10 Ranges. 1 MV to 300 V RMS.
10 Ranges. D.B. minus 40 to plus 50 DBM.

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A.C.V. 0,1.5, 5, 15, 50, 150, 500, 1,500 R.M.S.
A.C.V. P. to P. 0, 1.4, 4, 14, 40, 140, 400. 1,400, 4,000.
Resistance, 1 ohm to 1,000 megohm.
D.B. Minus 10 D.B. to plus 65 D.B.

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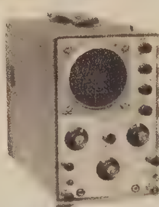
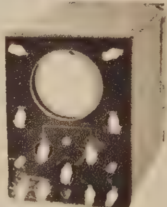
H.V. Probe to 30 KV, $7.75.
T.M.K. Units, $53.50.

TEST EQUIPMENT





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T.E. 15 Transistorised, 7 Band, 360 Kc to 270 Megs.

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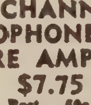

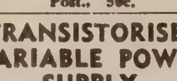

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240 V. A.C. Power.
To suit magnetic P.U. tape or microphone.
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Gain 60 D.B.

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TV and F.M. 2 to 270 Megs. 5.5 Meg. Crystal for TV sound. Sweep width to 12 Megs. Model 531.

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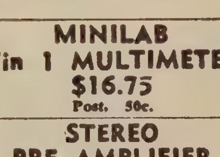

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Output (RF)—High 100,000uV max. Low 100uV max.
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Modulation — 400 cps internal.
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Complete with Instruction Book circuit.

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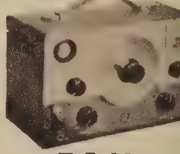

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Capacity 20 pfd to 2,000 mfd
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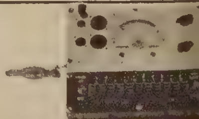

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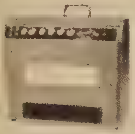

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hannel, Bass and Treble Boost. Twin Cone Speakers, $105 52/10/).

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14 plus 14 WATT

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5in. Mylar LP 900ft. ..	1	0	0
5in. Mylar DP 1200ft. ..	1	5	0
5¾in. Mylar LP 1200ft...	1	5	0
5¾in Mylar DP 1800ft	1	17	6
7in. P.V.C. 1200ft. ..	1	5	0
7in. Mylar LP 1800ft. ..	1	17	6
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6in	8in	12in
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20 Watts Power.
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Weight 1½lb.

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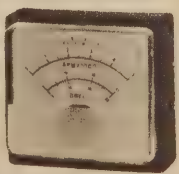

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636 KING STREET, NEWTOWN—51-7008

136 VICTORIA ROAD, MARRICKVILLE — 51-3845

B.S.R.

4-TRACK DECK
2-Track, 3-Speed.
$35.50 £17/15/-
4-Track, 3-Speed. Mono or Stereo.
$45.25 £22/12/6
4-TRACK. 3-SPEED.
3 HEADS.
$49.50 £24/15/-

BRADMATIC HEADS
Latest ½-Track. Hi Fi.
$9.50 £4/15/- pair

4-TRACK or STEREO
Record play back $11.50
erase $5.50

THE NEW COLLARO TAPE DECK

Takes 7in spool.
3 speeds: 1⅞, 3¾, 7½ i.p.s.
2-track, $44.
4-track, $48.
Write for particulars.

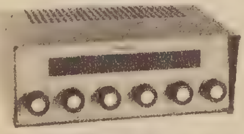
TRANSISTOR POWER SUPPLIES

12v. D.C. Input. 300v, 150Ma. Output plus 150v. Output.
$23.75 £11/17/6
12v. D.C. Input. 400v, 150Ma. Output plus 200v. Output.
$29.75 £14/17/6
240v. A.C. INPUT
9V. 200 M.A. $4.75
4.5V. 6V. 9V. 12V. 200 M.A. $5.75
9V. 12V. 15V. 22V. 500 M.A.
$7.75
Post: N.S.W., 50c; Interstate 75c.

VARY. A.C.S.

240-270V 50 cycle 5 amp.
Provide infinitely variable AC voltage
$29.50 £14/15/-
2½ Amp as above
$23.50 £11/15/-
10 amp. as above.
$45.75

PLAYMASTER 106 AND 107



Feb. and March Elect. Aust.
106
WIRED AND TESTED. $88.75
107
WIRED AND TESTED. $79.00

TRANSISTOR RECORD PLAYER

Portable. 2-speed. Moulded Cabinet
$29.75
A.C. Power Supply if required to suit this unit. $4.75.

Transistor-Ignition HI-SPARK

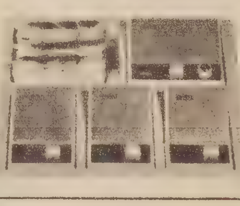
Simple installation.
38 K.V. output.
Complete. Tested.
Positive earth.
$41.50 £20/15/-
State voltage and polarity.
Post., N.S.W., 75c; Interstate, $1.25.

CITIZENS BAND

27.240 Megs.
10 Transistor Transceivers.
100 M.W. output.
$45.00
1. Watt 13 Transistor 1 channel with squelch.
$65.00 each (£32-10-0)
1 watt. 15 transistor, with squelch provision for two channels. Range to 10 miles under ideal conditions.
$80.00 £40 each

INTER. COM. UNITS

2 Station Transistorised
$11.50 £5/15/-
4 Station, including Master
$20.25 £10/2/6



New Telephone Amplifier

Transistorised.
$11.50 £5/15/-
Post 35c.

SPEAKERS

3-8-15 OHMS

6inch	$3.50
8inch	$4.25
12inch	$5.25

Plus postage 50c each.

LATEST 4-SPEED PLAYER3

240V A.C. Mono	$11.50
240V A.C. Stereo	$17.00
Battery Mono	$19.50
Battery Stereo	$21.50
Battery Mono 45 r.p.m. in Cabinet	$9.25

Post., N.S.W., 75c; Interstate, $1.25.

ELECTRIC GUITAR

Pickup Units	$8.75
Accordion Pickup Units	$8.75
Harmonica Pickup Units	$1.95

Post., N.S.W. 40c; Interstate, 75c.

Send for full details on Radiogram Chassis, TV and Amplifiers.

AMPLIFIERS

Public Address Range
240V-AC

MINIATURE P.A. AMPLIFIER.
15 WATTS OUTPUT.

Multi Match Ferguson O.P. transformer input for crystal mike and pick-up with electronic mixing, P.P. EL.84 output	$39.50
30 Watt. As above EL34 P.P.	$53.50
40 Watt. As above EL34 P.P	$79.50
60 Watt. As above EL34 P.P.	$98.50

LINE OR VOICE COIL TRANSFORMERS.
MULLARD HI-FI RANGE.

5/10 with pre amp base and treble boost. Ultra Linear output	$43.50
5/20in. As above	$65.50

BATTERY-AC OPERATION

6 valve 6v plus 240v-10 watt	$55.50
7 valve 12v plus 240v-12 watt	$59.75
7 valve 12v plus 240v-25 watt	$71.75

TRANSISTOR P.A. AMPLIFIER C.A.-512

12VDC Operation.
Output 20 watts.
Current consumption at max. output, 2.2 amps.
Input. High imp. mic. Also 600 ohms and tape.
Independent gain controls.
Output: Imp. 4-8-16 ohms.
Freq. Response:
200 cps—6000 cps.
Dimensions: 2in x 6¼in x 8½in.
Complete with instruction book with circuit. All plugs.

PRICE $57.50

DYNAMIC MICROPHONES

DM-391 HI-Imp	$3.50
DM-175 HI-Imp	$4.75
DMS-3 HI-Imp	$5.50
DM-305, 600 ohms or HI-Imp. Suitable stand mounting	$9.75
DM-304 Dynamic Cardoid. 50 ohms or HI-Imp. Suitable stand mounting	$15.75
D.M. 307 HI-IMP.	£7/10/-
CM-10 Crystal HI-Imp. Suit stand mount	$5.75
DM-108 Cardoid	£5/17/6
DM-202 Flexible T Stand	£3/17/6
3 Section Floor Stands	£3/12/6

Post., N.S.W., 25c; Interstate, 35c.

WIDE RANGE LIGHTWEIGHT STEREO PICK-UPS

Ceramic Units, Sapphire Styli	$7
Diamond Styli	$1
Universal Ceramic Stereo Cartridge, Sapphire Styli	$2
Diamond Styli	$6

NEW WIDE RANGE SPEAKERS

15 ohm. Twin Cone

8in	$7
12in	$7
5in	$4
5in Tweeter	$3
4in Single Tweeter	$2
12in Heavy Duty 20 watt	$1

P.A. REFLEX HORN

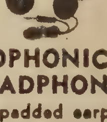
WITH UNITS

5 Watt 8 ohm	$14
10 Watt 8 ohm	$26
25 Watt, 16 ohm	$44
35 Watt, 16 ohm	$62

N.B.: As these are American ratin divide the wattage by 2.

STEREO RECORD CHANGERS

1965 model, 4-speed.
$21.50 £10/15/-
De Luxe Model.
Fully machined and balanc Heavyweight turntable. Cera cartridge.
$27.50 £13/15/-
Post. N.S.W., $1.25; Interstate, $1



STEREOPHONIC HI- HEADPHONES

With padded earpieces
SPECIFICATION:
Frequency Response: 25-17,000 c
Nominal Power 1 watt.
V.C. Imp. 8 ohms each chan
$7.75 £3/17/6
Post., 50c.

PHILIPS DISC JOCKEY

4-speed Players.
6V, D.C. OPERATION.
MONAURAL CRYSTAL HEA
$9.75 £4/17/6
STEREO
$11.75 £5/17/6
Post., N.S.W., 75c; Interstate, $1.

MORSE KEYS

New lightweight, fully adjustable u
$1.25
As above with buzzer.
Complete Morse practice set.
$1.65

A.C.E.

AMPLIFICATION

COMMUNICATION

ELECTRONICS

PHONE 51-3845

RADIO

136 VICTORIA ROAD, MARRICKVILLE, SYDNEY,
AND 636 KING STREET, NEWTOWN—51-7008

VENINGS and WEEKENDS: "KALUA," Hilma Street, Collaroy Plateau, XW5956

DULWICH HILL, EARLWOOD, BUS STOPS AT DOOR, STOP No. 42

NEW

ME LIGHT BATTERY

CLYDE OR DUNLOP
19 Plate. 150 Amp.
Dry Charged. Cells.

$3.25 £1/12/6 ea.

A.C. D.C. MOTORS

32V and 110V.
High Speed, Series Wound.
1/8 h.p. motors.

$3.75 £1/17/6

N.S.W. 75c, Interstate $1.25.

NEW VALVES

75c
75c
75c
$1.25
50c
55c
$1.00
75c
75c
75c
$1.25
50c
50c
50c
75c
50c
$1.00
26 .. $1.25
57 .. $2.00
75c
75c
6 .. $1.00
75c
$1.00
75c
$1.50
$1.00
75c
$1.75
75c
50c
75c
7 Metal 75c
$1.00
40c
95c
$1.25
75c
$1.25
75c
50c
75c
50c
50c
$1.00
$1.00
75c
$1.25
$1.25
$2.00
75c
879 . 50c
$1.25
$1.00
$1.00
50c
50c
$1.00
75c
95c
$1.00
50c
$1.00
75c
75c
75c
$1.25
50c

12SL7 ..	$1.25
47	$1.25
76	75c
84/624 ..	$1.25
723A ..	$6.00
807	$2.00
809	$1.75
813	$7.00
829B and Socket	$5.75
866A ..	$1.50
954	50c
956	50c
1603 . ..	50c
1616	50c
1619 . ..	$2.00
1629 . ..	50c
1050 . ..	$2.00
9006 . ..	50c
AV11 ..	25c
CA19 ..	$10.50
CK1013 .	$1.50
CV63 ..	75c
CV66 ..	75c
CV1102 .	75c
CV1133 .	75c
CV1136 .	75c
EBC33 ..	75c
EC70 ..	40c
ECH33 ..	$1.50
EF36 ..	75c
EF37 ..	75c
EF39 ..	75c
EF72 ..	40c
EF73 ..	40c
EK32 ..	$1.50
EL91 ..	$1.00
EM35 ...	75c
KTW62/6U7 ..	75c
RL27 ..	$1.50
VR65 ..	50c
VR75/30	$1.50
VR105/30	$1.50
VR150/30	$1.50
VT502 ..	$1.25
32	$1.00
42	$1.00
45	$1.00
37	$1.00
49	$1.00
53	$1.00
59	$1.25
89	$1.00
77	$1.00
CL4 . ..	$1.25
EM1 . ..	$1.25
TZ40 ..	$1.00
6AB7 ..	75c
6C6	$1.25
6SC7 ..	75c
7A6	75c
9006 . ..	50c

GENEMOTORS

Output		
600v 300mA	New ..	$11.00
500v 350mA	.. .. ..	$17.00
1200v 200mA	.. .. ..	$13.00
250v 100mA	New ..	$4.00
540v 200mA	New ..	$4.00
300v 250mA	New ..	$5.50
275v 110mA	.. .. ..	$7.50

CHASSIS PUNCHES

SIZES ⅝", ¾", ⅞", 1".
1⅛" with tapered
Reamer and Carry Box.

$5.75 £2/17/6

Post 50c, Interstate $1.00.

NEW POWER TRANSFORMERS

1960 5in CRO	$11.75
325 x 325 150MA	$9.50
285 x 285 300 MA	$14.70
800V and 270V 300MA ..	$15.00
240V-110V 1.3KVA Auto ..	$21.00
150 x 150V 30 MA	$2.75
225 x 225V 40 MA	$3.00
124V Doubler 300MA	$6.75
130V Doubler 400 MA ..	$7.75
145V Doubler 450 MA ..	$9.75
150V Doubler 500 MA ..	$10.75
220V Doubler 600 MA ..	$14.70
310 x 310 170 MA	$4.95

3" SELSYN MOTORS— TRANSMITTERS

50 V AC — 50 cps.

$5.75 £2/17/6

Post 75c, Interstate $1.00.

RELAYS

6V, 3-pole Miniature	$1.50
12 volts, DPDT, 5 amp ..	$2.00
12 volts DPDT	$1.25
100pf TX var. condensers ..	$1.00
Hi-speed Polarised relay ..	$5.00

PMG TYPE 3000

2000 ohms, $1.25
1000 ohms, $1.25

Lapel Crystal Mikes	$1.25
Crystal Mikes with switch ..	$1.50
Telephone Pick-up Units ..	$1.25
Contact Pick-up Units	$1.50
100UA Stereo Bal Meters .	$3.50

OIL FILLED CONDENSERS

.5mfd 600V	35c
2mfd 600V	65c
1mfd 600V	65c
4mfd 600V	65c
4mfd 2.5K	$3.00
1mfd 3000V	$1.70
.5mfd 5K, .1 5K, .1 3K AC .25 4K, .5 2½K .. .. ea.	$1.50
4mfd 3000V	$3.50
2mfd 3000V	$2.50
1mfd 3000V	$2.00
1.25 mfd. 6000v.	$4.50
mfd. 4000v	$3.00
2 mfd. 2000v	$1.50
4 mfd. 1500v.	$1.50
1 mfd. 1500v.	$1.00
8 mfd. 600v.	$1.00
1 mfd. 1000v.	$1.00

PYE REPORTER

2-way Vehicle Band Transceivers.
Ex-Taxi Cabs.
12 volt, 70 meg. Complete with valves and speaker.

$33.75 £16/17/6

NEW C.R.O. TUBES

3API-906 3in	$2.75
CV112 5in	$2.00
VCR97 6in	$3.75
ACR10/VCR139A 3in	$3.00
CV1522 1¾in	$2.25

6" INDICATOR UNITS

TYPE 1A
Suitable for C.R.O. conversion.
Circuit supplied.

$20.75 £10/7/6

Geloso 2615B

COMMUNICATIONS RECEIVER.
FRONT END.

$50

NEW HEADPHONES

5 Ohm	$2.25
2000 Ohm	$2.25
4000 Ohm	$2.50
American Lightweight	$1.25
Australian DLR	$1.25
Dynamic Earpieces, pr. ..	45c

Post 25c pr.

NEW STAND LAMP

18" Goose neck complete with shade. 3-core flex, plug and switch. Ideal for machine light, music light, reading lamp, table or TV light.

$1.05

Less shade 75c. Pack. and post., N.S.W., 75c; interstate $1.05.

WANTED

Communications Receivers. Test equipment. P.A. Gear. Large or small surplus stock. Best prices. Call, write or phone, any time.

TRANSISTORS

2N174	$5.00
2N442	$4.50
2N441	$4.00

High-powered units for 75-watt audio, 200-watt power units or transistor ignition.

NEW VALVE SPECIAL

In lots of 50 only.
5Y4, 5X4, 1616, 6K7.
$15.00 plus Freight.

60ft. extension speaker leads with miniature plugs or suit indoor aerial wire.

35c. Post 5c.

NEW G.M.F.

1/8 H.P. 240V-A.C. Motors.
2 speed. Reversible.
Capacitor Start.
Double ended drive.
Ball bearings.

$5.50 £2/15/-

NEW FAN MOTORS

2-speed. 1500-3000.
IDEAL FOR TAPE RECORDERS

$3.50

NEW METERS

Square. Clear Plastic.

2¼in 50 UA	$4.75
3⅜in 50 UA	$5.75
2¼in V.U. Meters	$4.75
3⅜in 1mA	4.75
2¼in 500V. A.C.	$4.25
2¼in 500V. D.C.	$3.50
3⅜in 500V. A.C.	$5.75
3⅜in 500V. D.C.	$5.00

Post N.S.W. 25c, Interstate 40c.

INTER COM TELEPHONES

15 Line Connections.

$7 £3/10/- each

PILLOW PHONES

Low Imp. VC Matchings.
Ideal Hospitals, etc.

$1.75 17/6 each

NEW
TRIO

COMMUNICATIONS RECEIVERS

9R59.D.E. SIDE BANDER
9 Valves. Mechanical Filter. New Design. New Bandspread.

$159.50

J.R. 200 KITSET

As described in Trade Review, July issue.

$89.00

Wired, Tested and Guaranteed.

$99.00

Other models—See August issue

J.R. 60

15 Valves. 5 Bands.
550 KC to 32 Megs.
+ 142 to 148 Megs.

£107-10-0 — $215-00

AR8. RECEIVERS

NEW CONDITION

$53.75

Converted for 240V AC Operation.

$75.75

AT5 TRANSMITTERS

$19.75

Aerial Coupling Units

$9.75

3BZ RECEIVERS

AIR TESTED. PERFECT ORDER.
6v Operation. 6 Band.
200 K.C. to 30 Megs.
Ideal communications Receiver or mobile and small ships' use.

$55.00 £27/10/-

AR7 RECEIVERS

Realigned. Air tested. Perfect order.
Rack Mounted or Cabinet

$105.00

3BZ TRANSMITTERS

AIR TESTED

55.00

522 TRANSCEIVERS	$25.75
522 RECEIVERS	$11.50
522 TRANSMITTERS	$13.50

522 TRANSCEIVERS

Complete With Valves.
100 to 156 Megs.

$25.75 £12/17/6

522 TRANSMITTERS

Complete With Valves.

$13.50 £6/15/-

522 RECEIVERS

Complete With Valves.

$11.50 £5/15/-

NEW ROTARY CONVERTERS

160 watt, 50 Cycle.
24v to 32v input.
Output can be supplied for 50-110 or 240v as required.
Suit radiograms, TV, Tape Recorders, Fluorescent Lights.

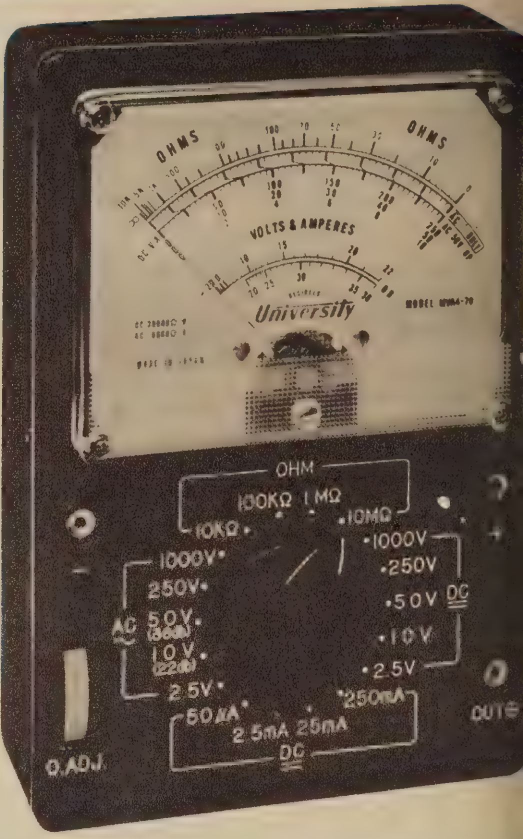
$39.75 £19/17/6

450 Watt, as above.

$73.75 £36/17/6

20,000 ohms per volt
Diode protected
Famous "University"
Full range multimeter
Full size 4 3/16" x 6"
INCLUDING TEST LEADS

$14.50
plus 12½% sales tax
Packing and freight $1.00



UNIVERSITY GRAHAM INSTRUMENTS PTY. LTD.

106 Belmore Rd. Riverwood. N.S.W.

Available through all wholesale & Retail outlets.

REPRESENTATIVES:

W.A.: Atkins (W.A.) Ltd.,
894 Hay Street, Perth, W.A.
S.A.: George Procter,
52 Gawler Place, Adelaide, S.A.
VIC.: Eastern Instrument Services Pty. Ltd.,
38 Milton Parade, Malvern, SE4.

QLD.: Keith Percy & Co. Pty. Ltd.,
Box 1478V, G.P.O., Brisbane, Qld.
TAS.: W. P. Martin and Company,
188 Collins Street, Hobart, and 134 Cambridge Street, Launceston.

Sure Brite Picture Tubes

ALL TYPES OF TUBES AVAILABLE EXCEPT BONDED

Year Warranty
$10 plus dud

2 Year Warranty
$12 plus dud

Second Quality
$8 plus dud

27 inch $20 plus dud
All prices cash or COD

THESE ARE
TRADE PRICES

FULL WARRANTY:
Any tube returned to Sure Brite under warranty is replaced with another one at no extra charge. regardless of whether it tests good or not, so long as it is not broken.

COUNTRY CUSTOMERS
Rail tubes to Lewisham Station, freight paid. Orders filled same day received. All freight charges to be paid by customer.

LARGE STOCK
We always have all types in stock, except bonded. When ordering state which price tube you want, otherwise the $12 tube will be supplied.

DELIVERY
Free delivery on tubes, same day inter suburb
only

SECOND QUALITY TUBES
Some Second Quality Tubes at only $8.00 plu
dud.

DUDS
Must be under vacuum and scratch free.
We can sell 17 inch without dud for $6 extr
21 inch without dud for $8 extra.

12 VOLT TUBES
We can supply tubes with 12 volt 300ma heater

Sure Brite Picture Tubes

22A VICTORIA STREET, LEWISHAM, SYDNEY, N.S.W. PHONE 56-6363

LISTENING AROUND THE WORLD

Art Cushen's monthly report on long-distance short-wave, television and broadcast band reception.

Another Channel for Radio University

dio University, VL2UV operated by the University of New
uth Wales, now has two channels. Sydney remains on
50KHz, while Newcastle and Wollongong transmit on the
new frequency of 1720KHz.

tations formerly shared a common
ey of 1750KHz, originally used ex-
by the Sydney station, and the
ters at Wollongong and Newcastle
art of the transmission time on this
ey. The result of the recent changes
Newcastle on 1720KHz is now on
on Thursday 0845-1200GMT, also
sday 0845-0945, while the Wollon-
ation is on the air on Wednesday
5GMT. The power of the Sydney
llongong stations is rated as 300W
castle 150W.

tations carry lectures on many sub-
r students in the three areas and
ion on the broadcasts can be re-
rom the University of New South
ox 1, Kensington, N.S.W. The Sta-
anager of VL2UV is Mr H. G.

casts of all three stations are well
in eastern Australia and New
and the station verifies reception
L card.

GH POWER FOR VATICAN.

e Vatican recently, Pope Paul VI
ted a new transmitter building at
Radio, Santa Maria di Galeria. The
nsmitting unit comprises two RCA
ve transmitters of 100KW each, and
wn-Boveri medium-wave transmit-
50KW. The three new transmitters
gift from American Catholics, and
umed that this is one reason why
Radio has been received at much
d signal level in recent weeks. The
wave frequency 1529KHz has also
ard at dawn at good level and it
a broadcast in English at
T.

n Radio has also been noted in
to North America from 0050, when
770KHz. French is heard at 0110,
her channels are 5985, 7250,
z.

ROPAGATION CONDITIONS.

of our new readers have requested
tion on the reason for altered pro-
conditions which dictate frequency
. A recent item in the Radio Neder-
X Juke Box program gives some
ion on this short-wave condition,
lters the reception quality of signals
ut the year.

gation conditions are changing all
e, from day to day, from season
n; and also over the longer period
eleven years, because of sunspot
During periods of high solar acti-
rt-wave conditions are good, giving
n over a wide range of the short-
ands, including all international
The last maximum sunspot
was in 1958 when new relative
of more than 200 occurred in Janu-
ust and September of that year.

During this maximum (the highest ever recorded since measurements started around 1750) some unusual signals were observed. In New York taxi drivers on 13MHz communicated with similar traffic in the Netherlands. Television signals from Venezuela, were seen in the United States, and BBC Television on 45MHz was seen in South Africa. The next maximum is scheduled for about July, 1968, but it is expected to be a count of between 125 to 150. This will mean, for listeners on short wave, that the 13 and 11 metre bands will be opened for long-distance reception, as the trend is always in that direction in our summer.

RADIO MALAYSIA.

The new overseas service schedule of Radio Malaysia at Kuala Lumpur shows a retiming of the first English period, which in the past has been heard with news at 2400GMT. The new schedule is 2245-2315 and 1115-1215GMT on 6110, 6175 and 11900KHz. Indonesian is carried 2315-0015, 0100-0200 (Sunday), 0900-1100, 1230-1630 on the same frequencies. The newscasts in English are at 2300 and 1130GMT. The last transmission is best received in New Zealand at 1130GMT on the 6175KHz channel, which provides very good reception, but has some sideband interference from Latin American signals at this reception period.

RADIO TEHERAN - IRAN.

The external services of Radio Iran in Teheran over the past few months have been reported on various frequencies, as yet another country joins the field of international broadcasters with high-powered transmitters.

The present schedule of the transmissions according to advice received from Radio Teheran for its overseas listeners is as follows: 15150 and 11755KHz, are used to Europe, 1730-1800 in Russian, 1800-1830 Turkish, 1830-1900 Arabic, 1930-2000 French, 2000-2030 in English.

The station verifies with a form letter and generally sends to its English-speaking listeners a publication "Iran Today" in English which shows in picture and words the progress of the country.

LATIN AMERICAN NEWS

From many of our listeners in Australia we find that, as in New Zealand, the glamour spot for listening this season is South and Central America, as more and more signals on the 60 and 90 metre bands become audible—many at excellent strength when one takes into consideration the low power used.

HONDURAS—Radio Evangelica H.R.L.C. has been heard on 4820KHz with sign on at 1200GMT when station identification is given. Broadcasts of gospel programs follow with news in Spanish at 1215GMT according to Bob Padula, Melbourne.

PERU—OAX3V Radio Horizonte, using 4785KHz opens at 1100 and fade out is 1215GMT. Radio San Jose, OAX8R, is on 4825KHz, and this station opens with the Peruvian National anthem at 100GMT. OAX9E Radio Tropical on 4937KHz opens at 1052GMT.

ECUADOR—Best signals reported include HCFA4 using 4810KHz which is heard with news 1130-1200; also we have reported this one at 0600GMT. HCMX4 Radio Cenit, uses 4770KHz and reception was noted at 1130GMT.

VENEZUELA—Radio Nacional de Venezuela, at Caracas opens at 1000GMT with the playing of the "Trumpet Voluntary" on 6170KHz; the signal suffers some sideband interference from Radio Malaysia on 6175KHz. Radio Popular YVMG at Maracaibo, on 4810KHz is consistently tuned at 1015GMT. On 4870KHz reception of Radio Tropical, Caracas, has been observed. The callsign is YVKP and reception is at 1030GMT.

RADIO BELGRADE

Several of our readers have asked in recent months about the reception of Radio Belgrade, Yugoslavia, one of the most recent being Mr F. Matta, of Chesterfield, N.S.W. Radio Belgrade is best received in this part of the world during the two English transmissions at 1830 and 2200GMT. The first transmission is received on 6100KHz, and the second transmission from 2200-2215 is on the air on 6100, 7200 and 9500KHz. The station has three transmissions in English each day, the first one, which is for reception in the Far East and Middle East, being on the air 1530-1600GMT using 9505, 11735 and 15240KHz. This transmission gives the best reception during our summer months, while the second and third transmission can generally be received throughout the year.

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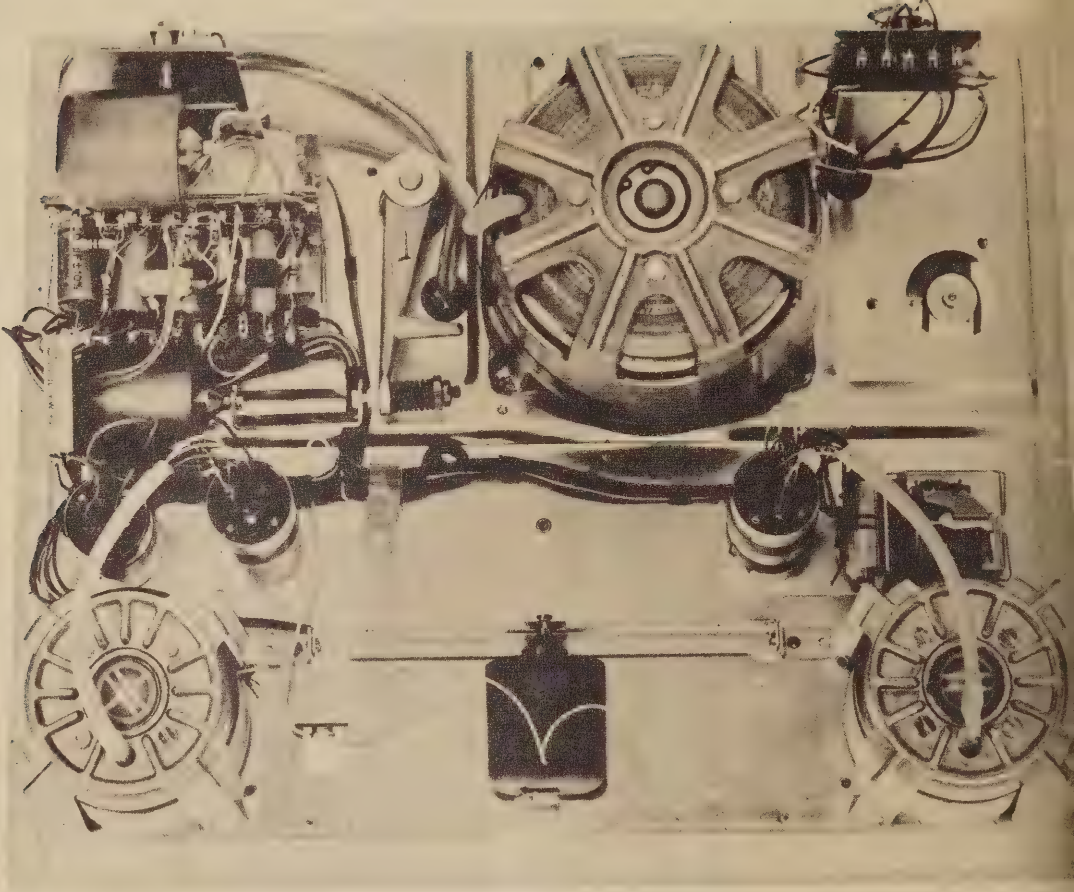
Three motors



N.A.B. Spool centres are
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TAPE RECOR

With the use of three motors, the ultimate in simplicity can be achieved. Two motors for winding and rewinding and a third, the Capstan motor, for smooth and even tape transport during recording and replaying. There are no belts — other than that for the counter — no levers and no gears required for engaging the various operating modes.

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RADIO MAURITANIE.

mail verification card from Radio tanie shows that the station has the of 30KW on its short-wave frequen- The station is located at Nouakcnott, ne card shows a map of Africa with location of the station marked. ransmissions 1349KHz with 1KW on nd 3222, 9610 and 6034KHz, all with ower of 30KW. Transmission times 0700-0800, 1800-2230 on 3222 and Hz, and 1200-1400 on 6034KHz. The operates in Arabic, French, Hassa- Toucouleur Sarakole and Ouolof, and s from B.P.200, Nouakchott, Mauri-

ALL INDIA RADIO

India Radio at Delhi has recently ded its international services, as reported previous issues, and now is also g to listeners a new and attractive ation card. In the past the A.I.R. has only acknowledged the date of ion; this new card includes the fre- y and time of reception, which is of value to the shortwave listener. A program guide and details of the s of the Delhi station are also sent with the verification letter.

General Overseas Service to West 1745-1945GMT uses 11705KHz. To e 1945-2230 on 7215, 9915KHz. To Africa, 1945-2015 on 9690 and KHz. To Australia and New Zealand 230GMT the transmission is on KHz.

ad of the B.B.C.'s External Ser- es News is Mr Kenneth Fairfax, o took up this position on April this year. He is responsible for e B.B.C.'s output of 170 news lletins broadcast every day in glish and 36 other languages to overseas listeners.

UNG LISTENERS HEAR ZAMBIA

o of our youngest readers must be n and Solly Voron, aged 15 and 11 ctively, at Coogee, N.S.W., and from teresting items they send, is the recent ule of the Zambia Broadcasting Service saka.

e schedule is as follows:

eral Service:

0445 3275KHz (30KW) 2455, (10KW).
0630 3275 (20KW).
1430 4911 (20KW).
1600 3275 (20KW).
2005 3275 (20KW), 2455 (10KW).

ME SERVICE:

0445 3346, (20KW), 2360 (10KW).
1300 4965 (20KW).
1800 3346 (20KW).
2005 3345 (20KW, 2360 (10 KW).

medium - wave stations carry the Service, and the stations are Lusaka Hz, 2KW; Kitwe 746KHz, 20KW. The al Service is carried by Kitwe 548 20KW, Broken Hill 596KHz, 2KW, stone 650KHz, 2KW Lusaka 962KHz, Ndola 1215KHz, 1KW.

A.B.C. SCHEDULE OF BC RELAYS

The Australian Broadcasting Commission operates relays of its medium-wave programs for reception in the inland areas of Australia and New Guinea. The present schedule of these services is as follows:

			KC
Sydney	VLI6	2000-1407 (Sat. 2030)	6090
Melbourne	VLG15	2000-2200	15220
	VLH11	2000-2215 (Sat. 2030)	11880
	VLH15	2230-0815	15230
	VLH9	0830-1407	9680
	VLR6	2000-2200 (Sat. 2030)	6150
	VLR9	2215-0830	9680
	VLR6	0830-1400	6150
Brisbane	VLQ9	2000-1407 (Sat. 2030)	9660
	VLM4	2000-1407 (Sat. 2030)	4920
Perth	VLW6	2200-0000 (Sat. 2230), 1030-1607	6140
	VLW9	0015-1015	9610
	VLX9	2200-0000 (Sat. 2230)	9610
	VLX15	0015-1015	15425
	VLX9	1030-1607	9610
Port Moresby	VLT4	2000-2200 (Sat. from 2030)	4890
	VLT4	0730-1400	4890
	VLT9	2215-0715	9520
	VLK3	2000-2200 (Sat. 2030)	3925
	VLK4	2215-0715	4890
	VLK3	0730-1400	3925

FLASHES FROM EVERYWHERE

FRENCH GUIANA operating in its home service ORTF Cayenne, is now 0915-1100 on 1500, 3385 4892KHz. 1500-1730 on 4892, 6180, 2030-0100 (Saturday to 0200) on 1500, 3385, 4892KHz. The station has news in French at 1030, 1630, 2130 and the announcement is "Ici Cayenne office de Radiodiffusion-Television Francaise."

ETHIOPIA station operated by the Government from Addis Ababa, as Radio Ethiopia, is noted in Arabic at 1800GMT on 6185 now with 100KW and also on 7265KHz at the same time. These tranmitters are carrying the same program at this time of reception in Europe.

BURUNDI Radiofusion Nacional du Burundi at Bujumbura, is now heard on the new frequency of 6140KHz to sign off at 2105GMT.

LISBON in its Voice of the West program, is on the air 0730-0815GMT and the transmission is for reception in Australia and New Zealand. According to Brian Prosser, of Riversdale, W.A., the best signal in his location is on 11840KHz. The station is also being reported on 17880KHz at the same time with this English transmission.

ALGERIA has been heard by Bill Hawthorne, of Warrnambool, Vic., with French at 2130GMT on 6175KHz. At 2200 the station had a 30-minute transmission in English and strength at this time was good. Radio Algiers continues to use 6080KHz at 0600GMT, and causes some interference to Radio New Zealand on the same channel.

DELHI transmissions to South-East Asia are on the air 1000-1100GMT, when using 15105, 17855 and 21615KHz. The service is also carried at this time for Australia and New Zealand, and the frequencies used are 11710 and 15165KHz.

PAKISTAN has made frequency changes to Radio Karachi in some of its Asian language services, uses 15203KHz from 1730 to 1830 as well as on 11672KHz in Arabic, and from 1600-1715 in Afghan and Persian the station is using 9640. From 0845 to 0945 the station is using 17950 and 21590 for the Indonesian service. Karachi in its service to Europe in English is on the air 1945-2030 using 9770 and 11672KHz.

SPANISH station "La Voz Santo Lucia" in Cordoba is using 6280 at 0645-1000 and 1600-2200GMT, and in the period 0700-0900 week days the program consists of Spanish-French and Spanish-English courses. This low-powered station has been widely reported in Europe and it relays a medium-wave station.

UNITED NATIONS programs from the U.N. Headquarters in New York are generally carried over the Voice of America transmitter, but some programs of the U.N. are carried by stations in Europe. The French Radio is on the air in Arabic 1115-1130 on 17740, 21620KHz. Radio Rome, Italy, is on the air in Arabic on Monday with a U.N. program which is carried 1855-1900 on 9575, 11810 and 15385KHz. A transmitter near Geneva, Switzerland is used in Russian on Friday 1800-1830, on 7443KHz. This frequency is outside the normal 41M band, but is scheduled as a point-to-point service.

VATICAN RADIO continues to be observed on new frequencies, and the Swiss DX Session reports they have been observed on 11865KHz and 15135KHz at 1715GMT in a program which is presumed to be in Lithuanian.

CLANDESTINE station with the slogan "Radio Portugal Libre" is now being observed using 12008KHz from 0700-0730. A year ago the station was observed in Europe from 1900-1930 when it was using 9452KHz, with a further transmission 2100-2200GMT.

SWITZERLAND in its transmission to Asia at 1330GMT has replaced the program service from Berne of 15305KHz with the new channel 15335KHz. The Swiss DX Session, from which this information was received, is heard on Saturday at 0730GMT when using the frequencies of 9595 and 11775KHz.

CONGO station in the former Elizabethville has been reported to be using either of two frequencies, and it is now reported that Radio UFAC is on either 5070 or 5012KHz. A report states they are on 5012KHz in English and noted at 1955 to sign off 2030GMT. The station asks for reports to P.O. Box 97, Elizabethville, which has been renamed Lulhumbashi, as from July 1, when some other

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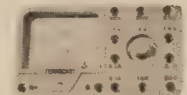
HAM RADIO SUPPLIERS

5A MELVILLE STREET, HAWTHORN, VICTORIA
Phone 86-6465
ESTABLISHED 1947

FERROCART POCKET MULTIMETER

Model PT34



300 uA movement. AC and DC voltages: 0-10, 0-50, 0-250, 0-500, 0-1,000c. Current ranges (mA) 0-1, 0-100, 0-500 mA. Ohms range: 0-100,000

Size 3¾ x 2½ x 1¼ inches.

Price 57/6. $5.75

inc. tax

Complete with leads.

MULTIMETER MODEL 200H

20,000 ohms per V. d.c. 10,000 ohms per V. a.c.

Specifications:

DC volts: 0-5, 25, 50, 250, 500, 2,500.
AC volts: 0-10, 50, 100, 500, 1,000.
DC current: 0-50 uA.; 25, 250 mA.
Resistance: 0-60 K ohms: 0-6 meg.
Capacity: 0.01-0.3 uF. (at AC 5v); 0.0001 - 0.01 uF. (at AC 250v).
Decibel: Minus 20 db, plus 22 db.
Output range: 0-10, 50, 100, 500, 1,000.
Battery used: UM3 1.5s, 1-piece. Dimensions: 3¼ x 4½ x 1⅛in.

Complete with internal battery, testing-leads and prods.

Price $11.25 inc. tax

LSG 11 SIGNAL GENERATOR

120 Kc.-390 Mc.

Freq. range (six bands): 120 Kc to 130 Mc on fundamentals: 120 to 390 Mc. on harmonics. Mod. freq. 400 and 1,000 c.p.s. Tubes: 12BH7, 6AR5. Rectifier: Half wave selenium. Provision for crystal oscillator (xtal not supplied). 1 to 15 Mc. 100, 117 or 230v. A.C. input, 50/60 c.p.s. Size: 7½ x 10¾ x 4½in. Weight: 6lb.

Price £15/5/- ($30.50)

inc. tax

MULTIMETER

Model CT-630

30,000 ohm/volt DC
15,000 ohm/volt AC
DC Volts: 0.3, 0-15, 0-60, 0-300, 0-600, 0-1200.
AC Volts: 0-6, 0-30, 0-120, 0-600, 0-1200.
DC Amperes: 0-0.03, 0-3, 0-30, 0-300mA.
Ohms: 0-16K, 0-160K, 0-1.6M, 0-16M, (10, 100, 10K, 100K at centre scale)
Decibels: Minus 20 to plus 46dB.
Dimension: 90 x 132 x 36mm.
Net weight: 380g.

Price: £9/5/- ($18.50)

SINCLAIR Z-12 INTEGRATED HIGH FIDELITY PRE-AMPLIFIER AND 12 WATT AMPLIFIER

PRICE £9/15/ ($19.50)

inc. tax

POWER SUPPLY for Z-12: 6, 9, 12, 15 volts at 1 amp,

PRICE £7/17/6 ($15.75)

inc. tax

SPECIFICATIONS:

No. of transistors: 8.
Overall size: 3in. x 1.8in. x 1.3in.
Weight: 3oz.
Output power into 3 ohm load:
  5 watts RMS continuous with 12-volt supply.
  8 watts RMS continuous with 15-volt supply.
  13 watts RMS continuous with 18-volt supply.
Output power into 1.5 ohm load:
  10 watts RMS continuous with 12-volt supply.
  16 watts music power with 15V. supply.
Power response: 1.5dB below 1KC at 20KC and 65 cps.
Frequency response: 15 c/s to 50KC plus or minus 1dB.
Input sensitivity: 2mV into 2Kohm.
Quiescent consumption: 12-volt supply—15mA.
Signal to noise ratio: Better than 60mA.
Total distortion: Less than one per cent.

SWR METERS Model KSW-10

STANDING WAVE RATIO
MODEL K 109
FORWARD
REFLECTED
SENSITIVITY
SELECTOR

SPECIFICATIONS:

Standing Wave Ratio: 1:1 to 1:10.
Accuracies: Plus or minus 3% scale length.
Impedance: 52 ohms and 75 ohms.
Meter: 0-100 DC microamperes.

PRICE £9/10/- $19 inc. Tax.

3 WATT 4 TRANSISTOR AMPLIFIER.

Circuit: 4 Transistor Push Pull. Output Power: 2 Watt, 10 p.c. U.D. 3 Watts Maximum. Gain: 10 mv for 2 watt output at 1 Kc. Output Impedance: 8 ohms and 16 ohms. Frequency Response: 150—10,000 c/s. Current Consumption: 12 mA at no Signal. 500 mA for maximum power.
Dimensions: 3in x 2in x 1in.

PRICE $9.75 (£4.17.6d.)

inc. tax

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COMMUNICATION RECEIVERS, TRANSMITTERS, TEST EQUIPMENT, AMPLIFIERS, TRANSISTOR RADIOS, TAPE RECORDERS, SPEAKERS, TRANSFORMERS, ETC.

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10 WATTS

Manufactured to give stereo amplification o a wide frequency range, the Stereo Amplif uses the new 6GW8 Audio Tubes to attain fine performance. It has stereo inputs outputs to suit most requirements. We also supply any auxiliary equipment that be required.

SPECIFICATIONS

MAX. OUTPUT POWER: 10 Watts, 5 W per channel.
FREQUENCY RESPONSE: 50 to 15,000 c. plus minus 1 db.
HARMONIC DISTORTION: Less than 2 cent at normal levels.
CROSSTALK AT 1 KC: Better than 40
HUM AND NOISE: 40 db. below rated outp
INPUT (FOR FULL OUTPUT):
  Phono CER.: 0.22V., 100,000 Ohm.
  Phono x-tal: 0.24 V., 50,000 Ohm.
  Aux.: 0.15V., 150,000 Ohm.
OUTPUT IMPEDANCE: 4, 8 and 16 Ohr (Each channel).
SELECT SWITCH:
  1. Phono Stereo.
  2. Aux. Stereo.
  3. Phono—Mono.
  4. Aux. Mono.

Price: £19/
($38.00)
inc. tax

VOLUME CONTROL:
  Channel 1 with Power Switch and Channel 2.
TONE CONTROL:
  More than 14 db. at 10,000 c.p.s.
  More than 11 db. at 100 c.p.s.
VACUUM TUBE: 2-6GW8, 1-6CA4.
POWER SUPPLY: 240V, 50 c/s, A.C.
OVERALL DIMENSIONS: 11in x 6½in 4½in.
NETT WEIGHT: 10lb.

MULTITESTER MODEL OL-

DC volt: 0-0.3 1 10 50 250 500 1,000 5,00 (20,000 ohms/
AC volt: 0-10 50 250 1,000V (8,000 ohms/
DC Current: 0-0.03 1 50 500mA 10A
Resistance: 0-5K 500K 5M 50M
Capacitance: 250 pF-0.02 uF
Inductance: 0-5,000 henries
Decibels: minus 20 to plus 22 plus 20 to p 36dB (Reference: O dB equals 0.755 equals 1mW in 600 ohms).
Load Current: 0-0.06 0.6 60mA
Dimensions: 5.91 x 4.17 x 1.97 inch.
Weight: 650 gramms
Batteries: UM-3 1.5v x 2 BL-015 22.5v x 1.

Price: £9/17/6 ($19.75)

TRANSISTOR SIGNAL INJECTOR—$5.25

inc. tax

· Congo towns were given their
names.
CE. Many Greek nationals in Aus-
have written to us asking for advice
reception of Greek stations. We
them best on Sunday at 0555GMT,
a church service is carried on
and 9600KHz, but the lower power
not offer consistent reception. Some
local stations in Greece have made
ency moves and are now reported
rissa (5954), Tripoli (6003), Mytilini
), Karpenission (6500), Chios (6590),
kastron (7000), Serrai (7028), Janina
), Kozani (7948).

SCHE WELLE in Cologne, Ger-
, has been noted on the new channel
820KHz in Persian 1625-1720, while
station has been noted at 1815 on
KHz. Cologne in a transmission in
nan 2000-2030 has been heard in
pe on 15380KHz.

DAD has made a time change in
ansmissions to Europe, and is now on
ir in English 1930-2020. They are in
ic 2020-2110, and 2110-2200 in
ch. They use 6030 and 6095KHz for
broadcast according to the Swiss DX
on.

N with the program "The Voice of
West," which is broadcast by the
guese National Radio frequently in
sh, is now using this slogan in
ch from 0615-0745GMT, on 6185
7130KHz. The English service
0900 is carried on 11840KHz.

DISCIO in the Somali Republic has
a frequency change from 7130KHz.
new channel 6096KHz is used with
KHz, 1630-1730GMT in Somali;
1800 in Arabic; 1800-1830 in Eng-
1830-1850 in Italian; 1850-1900 in
li. This information is from a verifi-
letter from the station received by
ener to Radio Australia DX Session.

RANCISCO station KGEI operated
e FEBC in Manila as one of their
of gospel stations, uses 50KW, and
the air 2330-0330 on 15240KHz,
a transmission beamed to South
rica. At 0330-0445 the station uses
KHz. The station is blocked in its
transmission by Radio Australia,
uses 15240KHz throughout the
mission time.

EN in its transmissions from Stock-
has made some changes for its
nce in North America. The trans-
ons are in Swedish 1515-1600 on
, 0100-0145 on 11805KHz. In Eng-
1400-1430, 1445-1515 on 17845,
0245 on 11805KHz. The program
en Calling DXers on Wednesday is
e air at 0200GMT. Spanish to Cen-
America from Stockholm is now on
0430 on 11705, 11880KHz.

ARIA is reported to be now carrying
nsmission to Africa in French from
to 2000GMT, using the frequencies
1840 and 15312KHz; and from
2200 on 9700, 11765, 11930KHz.

over ORTF broadcasts in English
1300-1330 to the Far East and the
am 1915-1940 beamed to Africa is
on 17845KHz. The transmission to
h Pacific territories 0800-0900 is
on 5960, 9560 and 11850KHz. News
ench from Paris at 1030GMT has also
observed on 21620KHz.

GASEY has two shortwave stations
annanarive, Radio University and
Nacional de Malagasey. The Radio
ersity station operates on 3370KHz
on Sunday relays the sporting pro-
s of Radio Paris in France. Radio
ersity operates week days, 0315-0430, 1530-1900 and on Saturday 0315-0430, 1200-1430 and 1530-1900, Sunday 1400-1700GMT. Radio University also uses the BC channel of 1275KHz.

TES from readers should be sent to
THUR CUSHEN, 212 Earn Street,
rcargill, N.Z. All times are Green-
Mean Time, add 8 hours for
h, 10 hours for Sydney, 12 hours
Wellington time. All frequencies
are in KHz.

BURUNDI station Radio Cordac, which is a missionary broadcasting station located in Bujumbura, is reported to be on the air 4920KHz at 1900GMT with 500W, when a religious service in English was noted to sign off 1930GMT according to listeners in Europe. The station also operates on 3995KHz, with the same program as in the 60M band.

BUDAPEST in Hungary is using two frequencies for relays of its European Service, 6234 and 7100KHz. The English program is noted at 2200GMT, while a program in German of 15 minutes duration is heard at 1945GMT.

AFGHANISTAN is reported to have plans to introduce its service to Europe again shortly. At present the best reception of the Kabul station is at 1400GMT, when the transmission is English and the frequency used is 4770KHz. Radio Kabul always verifies promptly, generally by registered airmail, and the verification card is of a scene in the Afghanistan mountains.

BROADCAST BAND NEWS

AUSTRALIA —The latest Australian Broadcasting Commission station to be heard is 6ED in Esperance, West Australia, using 840KHz with 5,000W. The station was opened on June 3 this year, and its recent reception in New Zealand has been at good level from 1500-1605 when it signs off in common with all the A.B.C. West Australia network. Major interference on the channel after 1400GMT is from an Indian station on the same frequency.

CAMBODIA—The Voice of Cambodia in Phnom-Penh has commenced to operate a second program, and this has been received on 1542KHz. The first Cambodian program has been heard on 1435KHz for some months, and news in English has been observed at 1230GMT. This new transmitter has a program of light English music, with announcements in French and Cambodian, and at 1615GMT a news bulletin in French is broadcast. Signals are good, but there is severe heterodyne on the channel from other Asian stations.

NEW ZEALAND—The new NZBC station at Tokoroa, which was listed to open in July on 1480KHz, is now on the air, but made a frequency change a few days before it commenced broadcasting. It is now using 1420KHz and the station is on the air from 1800-1120GMT except on Saturday when sign on is at 2100GMT, and Sunday sign off 1030GMT. The station has local programs from 1800-2100, and on Saturday 0600-0730. The rest of the programs consist of relays of NZBC network services.

INTERNATIONAL WATERS — The future of the off-shore radio stations in New Zealand is uncertain at the moment, following the New Zealand Government's announcement that they are considering legislation similar to that of the British Government to put the pirate stations off the air. Radio Hauraki, the first in the field, is now well advanced with plans for its opening on October 1, and will use 2KW on 1480KHz. This news has been followed by announcements of Radio International, to be operated by Keith Ashton, formerly of 2SM in Sydney, which is expected to use 4KW on either 1540 or 1570KHz.

Radio Hauraki is due to operate 1730-1000 daily except on Saturday when close down is 1400, and on Sunday they will open transmission at 9am NZT, which is 2100 GMT on Saturday. Their mailing address is P.O. Box 2964, Auckland. They promise to verify reports, and one of their disc jockeys, Brian Strong, formerly of 1ZD and a DX League member, is handling DX reports.

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   Also—just out from U.S.A., the two basic texts of the famous R.C.A. Home Study Course—"Basic Electronics" and "Fundamentals of Transistors"—the most thoroughly prepared and authoritative books ever produced on these subjects.
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☐ "Basic Electronics" RCA Institute's Autotext, **£5/13/- ($11.30).**

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☐ Details of the Electronics Maths Course based on the Slide Rule.

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Address .. ..

RESISTORS, CONDENSERS AND POTENTIOMETERS

We have purchased the resistor and condenser stock of manufacturers including S.T.C. and Stromberg-Carls who have ceased the manufacture of television and radio receivers and can offer same at less than 25 per ce of list price.

The resistors are mainly I.R.C. and Morganite in values from 200 ohm. to 5 meg. in ½, 1 and 2 watt ratin and include some wire wound resistors. List price, $9.00 per 100. **Our price, $2.00 per 10**
Post and packing 25c extra.

The condensers are in most popular makes and include mica, ceramic, paper and electrolytic in standard valu
List price, $11 per 100. **Our price, $2.06 per 100.** Post and packing, 35c ext

The potentiometers are all current types and include switch pots, dual concentric and T.A.B. pots.
List price, $12 per dozen. **Our price, $2.50 per dozen.** Post and packing, 25c ext

FREE For a limited period with each lot of resistors, condensers or potentiometers purchased we will supp free: One New Valve Type 6U7G, 6X5GT or IT4 as advertised on this page.

Imported National Transistorised Shoulder Megaphone

These shoulder megaphones manufactured by National Radio Japan have an output of 4 watts, and are supplied complete with inbuilt horn type speaker, batteries and microphone. List price $78.

Special Price $50. Post extra.

Other types also available.

NEW AMERICAN TWIN TELESCOPE TV AERI

Extends to 36in each se can be used singly for c portable .. ..

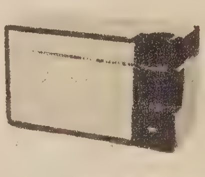
Post 20c.

NEW 4" EXTENSION SPEAKERS

These 4" speakers are mounted in polished cabinets suitable for use as intercom. units or extension speakers.

LIST PRICE .. .. $12.

SPECIAL PURCHASE ENABLES US TO SELL THESE UNITS AT $4. Post and packing, N.S.W., 68c. Interstate, 98c.



NEW GARRARD RECORD CHANGERS

These New English Garrard Changers with High Fidelity C Pick-ups and Sapphire Styli have just been superseded. We are some at LESS THAN HALF PRICE. Available in STERE $25.50. POST AND PACKING EXTRA, N.S.W., $1.50; QLD., TAS., $2.25; W.A., S.A., $1.30.

USED HIGH-SPEED 240V. AC/DC MOTO

These 240 v. a.c. or d.c. motors are 1/8 H.P. with a spe 7,000 R.P.M. and are ideal for small drills, grinders, etc. Dimen 5½in x 3½in. with 5/16in spindle .. ..
Post, N.S.W., 50c; Interstate, 85c.

NEW 4-SPEED STEREO PLAYER F.O.R. .. $17.50 (£8/15/)

NEW STEREO CHANGER. 4-SPEED F.O.R. .. $21.50 (£10/15/)

SLIDER-SWITCHES
10 pole 2-way silver plated contac

POWER TRANSFORMER

Prim. 240V Sec. 350 volts a side. One 6.3V, one 5V Fil.

$2.75 **Post N.S.W. 60c, Interstate 80c.**

LEADER SIGNAL GENERATOR L

240V A.C. operated, 6 band 120KC to 39
Provision for crystal.
Post N.S.W., 75c; Interstate, $1.25. $2

BATTERY CHARGER RECTIFIERS

New Selenium Rectifiers, 6 or 12 volt, at 4 amp., $3.75. Post, N.S.W., 20c; Interstate, 20c. Transformer for above rectifier tapped for 6 to 12 volt, with circuit for charger, $4.75. Post, N.S.W., 75c; interstate $1.00.
As above, 6 or 12 volt, at 2 amp., $2.75. Post, N.S.W., 35c; interstate, 45c. Transformer for above, $3.75. Post. N.S.W., 35c; Interstate, 45c.

NEW 240V. A.C. MOTORS

These small motors, size 5in x 3in x 3½in, are 1-12 but are only suitable for intermittent use. $2.95. N.S.W. 35c; Interstate 50c,

THE NEW COLLARO 3-SPEED TAPE-DECKS 2 & 4 TRACK

The ideal deck for the home constructor, as amplifier and all controls can be mounted on deck.

- **3-speed 1⅞, 3¾, 7½. • Pause control. • Takes 7in. spools.**
- **Simplified controls, 4 Track, $48; 2 Track, $44. OSC Coils, $1.50**

NEW B.S.R. TAPE DECKS

These new 3-speed B.S.R. Decks are fitted with a digital co and will take 7in spools.
2 Track, $35.50. 4 Track 45.25.

NEW "TECH" V.T.V.M. MODEL TE65

23 RANGES. 240V. A.C. powered.

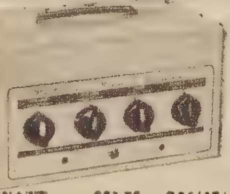
D.C.V. 1.5, 15, 50, 150, 500, 1,500
A.C.V. 1.5, 15, 50, 150, 500, 1,500.
D.B. —10db to +60db.
Resistance. 1 ohm to 1,000 megohm.

$42.50 POST $1.00

A PREAMP FOR MAGNETIC PICK-UP OR TAPE HEADS

SUITABLE FOR USB WITH THE COLLARO OR B.S.R. TAPE DECKS

Using 3 silicon transistors as featured in October. Electronics Australia complete with kit of parts including transistors mono **$7.50**, stereo **$13.00**, 240 power supply for above **$7.00.**



25 WATT .. $53.75, £26/17/6
17 WATT .. $43.75, £21/17/6
Post Extra on 15 Watt
N.S.W., 10/; Interstate, 15/.
25 Watt by Rail or Air.
Too Heavy, for Post.

NEW 17 & 25 WATT P.A. AMPLIFIER

The 25 Watt Amplifier uses 5 valves plus 2 rectifiers including two EF86 low noise valves as phone preamplifier and two EL34 valves Ferguson push-pull output.

All amplifiers are fitted with Ferguson output transformers with voice coil tappings of 2 to 15

The 25 watt amplifier can be supplied with line output transformer tapped from 100 to 600 o required at 20/extra.

Inputs provided for microphone, pick-up, and radio with mixing facilities and tone control.

The 15 watt is as above but using two 6BQ5 valves in push-pull output.

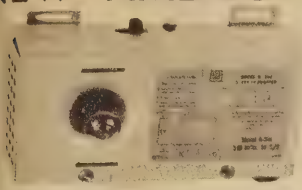
12in speaker for above (10 watt) .. .. $6.75 ..

Crystal Microphones for amplifier .. .. $4.75 ..

NATIONAL RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. PHONE 56-7398.

EW AMERICAN TV POWER BOOSTER UNIT AT LESS THAN HALF PRICE



$9.75 (£4/17/6) POST FREE

(EX LIQUIDATION STOCK H. G. PALMER)

These TV POW-R boosters can be used in two ways. Firstly as a "straight-thru" circuit giving extra boost to the TV signal for improved performance on one receiver.

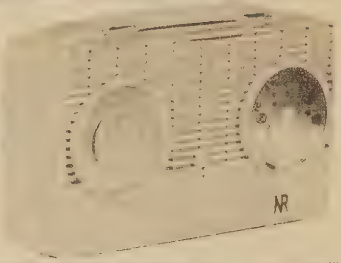
Secondly to boost signal strength to two or three TV receivers coupled to the one aerial.

Full instructions supplied with each unit. 240 volt A.C. operation.

Complete KIT for TRANSISTOR 6 PORTABLE $21.95

The complete kit of parts for the transistor six includes six transistors, printed circuit board, coil kit. 4in speaker, Ferguson driver and output transformers, heavy duty battery and all necessary parts to complete the set with full instructions. **Set is housed in attractive plastic case as illustrated.**

Dials available for all States. Post and Pack: extra. N.S.W., $1.00, Inter., $1.30.



NEW ENGLISH MAZDA TRANSISTORS

TYPE	EQUIVALENT		
XA101	OC45	R.F. Transistor	55c
XA102	OC44	Osc. Transistor	75c ea.
XB103	OC75	AUDIO general purpose	75c

Ducon type SFT 123 equiv, OC74 .. .. .. 75c ea.
Available in matched pairs at .. .. $1.50 pair
AUDIO OUTPUT
Post and packing on transistors 15c any quantity.

A.W.A. 23" E.H.T. transformers and 23" 110 deg. deflection yokes. New manufacturers stock E.H.T. units $5.00. Deflection yokes $5.00. Post free

NEW VALVES AT BARGAIN PRICES

1A7GT	95c	3S4	$1.00	6J5	75c	6SN7GT	95c	1L5G	95c
1C7G	30c	5Y3GT	$1.25	6K7G	45c	6S5 equiv. 6SK7.	85c	12A6	50c
1D8GT	95c	5V4G	$1.00	6K8G	68c	6U7G	45c	12SK7	50c
1K5G	40c	6B8	$1.00	6Q7G equiv, 6B6G	$1.00	6X5GT	75c	12SK8	50c
1K7G	40c	6C8G	50c	6SA7GT	95c	7C7	35c	12SH7	50c
1M5G	40c	6F6	$1.00	6SH7	55c	12AU7	$1.00	866	1.50
1P5G	25c	6H6G	35c	6SJ7	95s	12AT7	$1.00	954	25c
1Q5G	25c							955	25c
1T4	45c							7193	25c
3Q4	75c							EK32	68c
EF50	45c							EL33	$1.00

Please add postage on all valves.

EW 4-SPEED STEREO & MONO PLAYERS AT LESS THAN HALF PRICE

PHILIPS 4-SPEED 6V BATTERY PLAYER

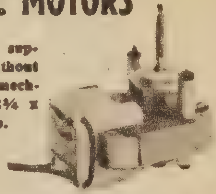
MONO $9.75
STEREO $11.75

Post and Packing, N.S.W., 75c.
Post and Packing, Inter., $1.25 Extra.

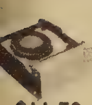
NEW 240V. ELECTRIC MOTORS

3300 R.P.M. can be supplied with or without 4-speed reduction mechanism. Size 3¼" x 2¾ x 3½, including spindle.

$2.75



NEW PORTABLE RECORD PLAYER CASES TO SUIT THE ABOVE TURNTABLE



Attractive two-tone cabinet with plastic trim.
Supplied with 5in x 7in speaker in felt-lined enclosure
Space for amplifier and batteries or power supply.

$11.50

Dimensions: 15in x 13in x 7in.
Post and Packing: N.S.W., 90c; Interstate, $1.20.

NEW MULTIMETER—$5.25

POST EXTRA
METER 0-1MA 1,000 OHMS PER VOLT
A.C. RANGES D.C. RANGES CURRENT
SUPPLIED COMPLETE WITH TEST LEAD
RANGE 0-100,000 OHMS

A.C. RANGES	D.C. RANGES		CURRENT
0—10v	0—100v	0—500v	0—500MA
0—50v	0—10v	0—1000v	
0—250v	0—50v	0—1MA	
0—500v	0—250v	0—100MA	

EXTENSION SPEAKERS

$8.50

New 9 x 6 speakers in case.
Post: Interstate, 55c; N.S.W. 40c.

EW POWER TRANSFORMERS

mA prim.: 240v with 230v tapping Sec. 5 x 285 with 6.3v filament winding. mA, $2.50. Plus Postage: N.S.W., 35c; terstate, 52c.

im.: 240v, Sec. 385 x 385 at 80mA, fil. 3 and 5v, $3.75. Post.: N.S.W., 40c; terstate, 75c.

mA H.T. Chokes, 75c. Post.: 20c.

T.M.K. MULTIMETERS

Before buying see our range of T.M.K. test instruments. As advertised in April issue of Electronics Australia.

NEW MIDGET POWER TRANS.

40mA prim., 240v. Sec 225 x 225 with 6.3v. Fil. Winding.

$2.75 Postage: N.S.W.., 25c; Interstate 45c.

30mA 240v Prim. 150 x 150v. Sec. with 6.3v Fil. Winding.

$2.75 Postage: N.S.W., 25c. Interstate 35c.

TRANSISTORISED SIGNAL INJECTOR, $5.50

A MUST FOR QUICK TROUBLE SHOOTING
Using TWO Transistors, complete with instruction sheet and battery. Post free.

NATIONAL RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. PHONE 56-7398.

SOUND PROJECTORS

Cinevox Prefect 16mm in good working order. 240v operated, complete with speaker and amplifier.

£57-10-0 $115.00

CIRCULAR SLIDE RULE

3¾in diameter. Will do the same work as the conventional slide rule. Instruction book included.

12/6 $1.25 each.

Post 10 cents

REFLECTOR GUNSIGHT

Contains these lenses:
1 Lens 1in Focus, 1½in diam.
1 Lens 1 11/16in Focus, 1¼in diameter.
1 Air-spaced Lens, 1¼in diam.
1 Filter Lens, 1 Graticule,
1 Lampholder.

18/6 $1.85

Post: N.S.W., 30c: Interstate, 40c.

PMG TYPE TELEPHONES

Standard desk type with magneto calling device. Range 30 miles. Uses standard batteries at each phone. Any number can be connected together on single line.

£11-10-0 $23.00

(2 TELEPHONE SETS)

30c cartage to rail. Freight payable at nearest attended railway station.

AERIAL CAMERAS

F.24 Mark IV 2.9 Lens, stops 11, 8, 5.6, 4, 2.9.
With 3in x 8in F1 Dallmeyer Lenses complete with wooden case.

£19-10-0 $39.00

50c Cartage to Rail. Freight payable at nearest attended railway station.

SHIPS' CLOCKS

(No bell). Smith's 8-day, fully jewelled. Original cost $120. Special 7in brass $25. 10½in Seth Thomas splash-proofed bakelite

£15 $30

Post N.S.W., 70c: Interstate, 95c.

ECHO SOUNDER

Depth and Fish Finder. Transistorised, with Neon Flasher Indicator, complete and Guaranteed.
V.D.C. operated (8 1.5 Torch cells).

£42-10-0 $85 Post $1.60

12 CREED TELEPRINTER

Tape printers model 47.R, 240 Volts operated.

£17-10 $35.00

TELEPHONE WIRE

21 gauge copper, plastic covered. Ideal telephone or bell wire. 1,320ft coil of twin (equal ¼ mile). $7.00 per coil.
Post, N.S.W. 70c: Interstate $1.20.

3000 TYPE RELAYS

P.M.G. 200 Ohm — 1,500 Ohm Coils, $1.25 each.

AWA OSCILLOSCOPE

Calibrated with delay time base. 5in, 240 vac., perfect.

£97-10-0 $195.00

AMPLIFIER

Subminiature 4-Transistor, Audio Push-Pull.

£3-10-0 $7.00 Post 50c

GOOSE NECK LAMP

NEW. IDEAL FOR DESK or WORK BENCH. Adjustable shade, strong metal lacquered base and frame. Height 18in. Complete with lead.

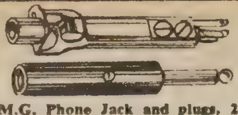
12/6 $1.25

Post and packing. $1.00.

DRAFTING MACHINE

Genuine Swiss-Wiles (Without Scale).

£9/15/- $19.50 Post $1.20



P.M.G. Phone Jack and plugs, 25c each, 45c the pair.
Post 7c.

NIFE CELLS

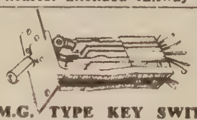
1.2 Volt fully charged, 4in x 3in x 1in 4 AH.

10/- $1.00 each

Post, N.S.W., 25c; Interstate, 35c.
1.2 volts 15 AH, 8in x 4in x 2in. $2.95.
2.4 volt 10 AH, 6in x 2½in x 2in. $2.50.
Post, N.S.W., 30; Interstate, 40c.

PERSPEX

Slightly domed shape, 16in x 12in, $1.55. 2ft 6in x 18in tapering to 6in, $1.75. 2ft 6in x 2ft, $2.45. Domed approximately 3ft 6in x 2ft, $5.50.
50c cartage to rail. Freight payable at nearest attended railway station.



P.M.G. TYPE KEY SWITCHES.
45c each. Post, 15c.

VALVES

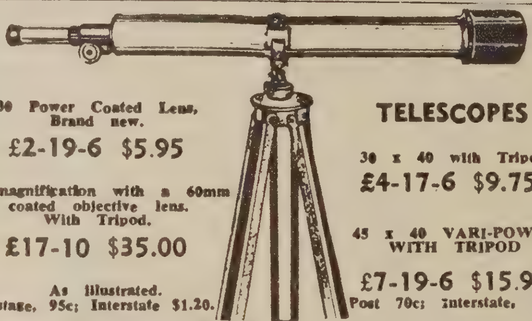
BRAND NEW

IN CARTONS.

Special discount for quantity

6SN7GT	95c	6AG5	50c
89	$1.00	X61M	$2.20
12SA7	$1.25	CV850	$1.50
6H6	45c	18H6G	30c
41	$1.25	832	$5.00
5U4G	95c	6F13	75c
77	$1.00	6AK5	$1.50
VR150-30	$1.00	6X4	$1.00
		6F8	75c
5CP1	$3\95	6N7	$1.00
EF50	35c	12SK7	50c
6U7	75c	VR1120	50c
V1103	$1.00	VR118	75c
VH120	75c	VR65	25c
IL4	$1.00	6R7GT	50c
5Y3	$1.50	VT4C	75c
6C4	50c	AU5	$1.00
CV2184	$2.25	80	$1.25
		6AK5W	$1.50

PLEASE ADD POSTAGE ON ALL ARTICLES.



30 Power Coated Lens, Brand new.

£2-19-6 $5.95

60 magnification with a 60mm coated objective lens. With Tripod.

£17-10 $35.00

As illustrated.
Postage, 95c; Interstate $1.20.

TELESCOPES

30 x 40 with Tripod

£4-17-6 $9.75

45 x 40 VARI-POWER WITH TRIPOD

£7-19-6 $15.95

Post 70c; Interstate, 95c.

HIGH STABILITY RESISTORS

I.R.C. brand new ½w., 1w, 2w, tolerances between 1 and not exceeding 5% including 100, 360, 560, 750, 15K, 22K, 27K, 100K, 180K, 220K, 560K, 820K, ohms. Usual price 40c each, 50 assorted different values for only

37/6 $3.75

Post 15 cents

GENUINE VARIACS

0-115 V.A.C. 18 Amps, $29 each, or couple 2 together for 240 V.A.C.

The two for $45

Genuine American Zenith Variacs

0-115 V.A.C. 7.5 Amps, $19.50 each or couple two together for 240 V.A.C.
The two for $36.
50c cartage to rail. Freight payable at nearest attended railway station.

522 TRANSCEIVERS

100 to 150 m/cs.

£17-10-0 $35.00

TR1934 TRANSCEIVERS

100 to 125 m/cs.

£16-10-0 $33.00

FRACTIONAL 240 V AC MOTOR

1/25 h.p., new, with coupled 2-speed gearbox. 1425 and 300 r.p.m. Ideal for rumbler, etc.

£10-0-0 $20.00

Post N.S.W., 70c; Interstate. 95c.

BATTERY CHARGER KIT

Complete, assemble yourself with instructions, 6 or 12 volts, 2½ amps. $7.95. £3/19/6.
Post: N.S.W. 70c. Interstate 95c.

C.M.A. CABLE

240 volt 3/.036 black, new and perfect. 100 yds. rolls, $3.00, 6 or more.

£1-5-0 $2.50

30c cartage to rail. Freight payable at nearest attended railway station.

MICROMETERS

Brand new Goodell-Pratt, 0 to 1in, $7.50; Slocombe, 1in-2in, $7.85; Starrett 1in-2in, $9.85.
Post, 32c.

CHOKES, 7.5H, 60mA 95c
VIBRATORS, 6 volts, 7-pin, 75c each.
UNISELECTORS, 4 BANK HOMING TYPE $4.00
INVERTERS, 26v-115v 2Kw 400 cycle $9.50
HAND MICROPHONES, with Press-to-Talk Switch .. 95c ea.
Post, N.S.W.. 25c; Interstate. 30c.
INSTRUMENT TRIPODS, sturdy wooden frame. Telescopic Extend to 4ft 6in $13.00
SELSYN MOTORS MAGSLIP Mk. II .. .. $5.25 ea.
No. 19 2-way radios, with hand set, power supply, leads. $35.00
Meggers, bridge type, complete and tested $75.00
EVERSHED and VIGNOLES, 500 volts.

ASTRONOMICAL TELESCOPES

3¼" Reflector. 126 Magnification complete with 4X Finder and Equatorial Mount.

£29-10-0 $59.00

Post N.S.W. 70c, Interstate $1.20

BINOCULARS

PRISMATIC. Coated Len
Brand new. Complete with
8 x 30 .. .. $
7 x 50 .. .. $
10 x 50 .. .. $
12 x 50 .. .. $
Post, N.S.W. 70c; Interstate,

SPECIAL ARMY RELEA

TELESCOPES

ALL LENSES
"ASTRONOMICAL" QUAL

General and Mari Use

4 x 40 Genuine HAND
Cost $60.00. Our Price.
7 x 40 GENUINE OT
ANGLE TELESCOPE. Cost
Our Price .. ..
15 x 40 variable Power O
$15.50.
Freight payable at near
attended railway station

PROJECTOR LAM

BRAND NEW PHILIP
240 volts. 750 watts.
Base down.

£1-5-0 $2.50

Post 13 cents.

BUBBLE SEXTAN

Mark 9 without bubble
With bubble .. ..

RECORDING TAP

SCOTCH BRAND.
EX-WOOMERA.
SLIGHTLY USED.
PERFECT ORDER.
Can be used for home video,
recording equipment, etc.
2,400ft 12in Reel ½in Top G
Cost $14.50. Our price
roll. Post 70c; Interstate,
Also same in ¼in. Ideal for
fessional quality audio reco
1200ft 7in reel ¼in $2.75. Pos
600ft 5in reel ¼in $1.68. Po
200ft 3in reel ¼in 65c. Po

SCOOP PURCHA

Gramo. Motors, New. Ma
U.S.A. 4-speed. 240 volt
50 cyc. Only $2.75 each.
Post, N.S.W., 30c; Interstate.

240-110 VOLT 6K TRANSFORMER

Encased, including switche
new. $50.

Top grade, fully enclosed
former. 1 Kva primary 2
vac. 50 cycs. secondary 6
37 volts, 53 volt, 60 volt,

LEAD ACID BATTERIES

New 2 volt 1.5 amp. $1.75, 1
0.75 amp. $3.75.
Post, N.S.W., 25c; Interstate,

SPECIAL lucky dip valve
15 new valves in cartons
only $2.00. We haven't got
to sort them, so you rea
benefit. Post, 30c.

SOLENOIDS

Plunger Type 12V 300M.A.
electric camera control, min
trains, radio, etc.
$1.25. Post 10c.
200 Mill. amp., 24 volt,
push movement.
$1.25. Post, 10c.

BATTERY CHARG

6 or 12 volt, 2½ amp.
Post, N.S.W., 70c; Interstate,

TELEPHONES

Sound Powered. Can be us
Microphone and Receiver,
With 50ft cable.
$3.85 pair.
Post, 25c; Interstate, 40c

Deitch Bros

70 OXFORD STREET, SYDNE

SORRY, NO C.O.D.

TECHNICAL BOOKS
ND PUBLICATIONS

IC ELECTRICITY FOR ELECTRONICS

ELECTRICITY FOR ELECTRONICS, by Robert Middleton and ton Goldstein. Published by Holt, ehart and Winston, Inc., New k. Hard cloth covers, 6in x 9in containing 694 pages. Generously trated. Price in Australia $10.55.

G. Middleton, one of the authors mpressive textbook, is a free-lance writer, a senior member of the and the author of more than 30 the field of electronics. Milton is Dean and Director of Research American Institute of Engineering nology, Chicago. He is also head sulting firm in Chicago, as well as umerous other positions.

y be expected, from such distingthors, this book is of the highest Published in 1966, this work is as e as such a book can be. The idea thors is to present the fundamentals icity and electronics, as a first nd to fulfil the needs of the technology student.

gh the authors suggest that this of the nature of a beginner's would hasten to point out that ject covered is dealt with in condetail; in fact, the standard is h. However, this does not mean ginner would have difficulty in unng the various descriptions, as each arts with basic principles. In short, at it would be an excellent ferme for students, even to some of advanced levels.

are 23 chapters and several secappendices, as well as a biblioach chapter has a set of questions lems, with answers given at the he volume.

MIDDLETON · GOLDSTEIN
BASIC
ELECTRICITY
FOR
ELECTRONICS

To give some idea of the subjects covered, here is a list of the chapter headings:

Chapter 1 — Electrons and Electricity.
Chapter 2 — Laws of Voltage, Current and Power.
Chapter 3 — Conductors, Semi-conductors and Insulators.
Chapter 4 — Series Circuit Analysis.
Chapter 5 — Parallel Circuit Analysis.
Chapter 6 — Series-Parallel Circuitry.
Chapter 7 — Principles of Magnetism.
Chapter 8 — The Magnetic Circuit.
Chapter 9 — Electromagnetic Induction.
Chapter 10 — Principles of Capacitive Reactance.
Chapter 11 — Principles of Inductive Reactance.
Chapter 12—Series AC Circuit Analysis.
Chapter 13—Parallel AC Circuit Analysis.
Chapter 14—Analysis of LCR Circuits.
Chapter 15—Series-Parallel AC Circuits.
Chapter 16—Transformer Principles.
Chapter 17—Motor Principles.
Chapter 18—DC Meters.
Chapter 19—AC Meters.
Chapter 20—Vacuum Tubes.
Chapter 21—Semiconductors, Diodes and Transistors.
Chapter 22—Filters.
Chapter 23—Network Theorems.

This is quite an impressive list. Unfortunately, space would not allow us to give a list of the chapter sub-headings. To all who may be interested, I can commend this volume, without hesitation.

Our review copy came from Rigby Limited, 22 James Place, Adelaide, S.A. (I.L.P.)

ONICS CONSTRUCTION TECHUES by George L. Ritchie. Pubby Holt, Rinehart and Winston, New York. Paper cover, 10¼in x 228 pp., illustrated with many line ings. Australian price $5.75. Our copy from Rigby Limited, 22 s Place, Adelaide.

ELECTRONICS
CONSTRUCTION
TECHNIQUES

designed as a text electronics in schools, practical uld be of le value who may a good in elecyet lack experience matters as nstruction, rototype circuits, preparation of iring boards, drafting circuits and shop tools.

t is divided into five basic sections Chassis Construction Assignments Circuits—Basic Shop Tools—ssembly—Appendix.

the subjects covered in the first ons is dealt with most comprewith considerable attention to detail. For example, in the section dealing with chassis construction, several pages are devoted to the subject of bend allowance for steel and aluminium, which if not taken into account can lead to badly fitting sections. Other chapters in this section of the book deal with chassis marking and labelling, and the various forms of metal finishing.

In the section of printed circuits, guidance is given on the techniques used, from the preparation of the layout right through to etching, and this is followed by a chapter on mounting components on the finished board. A supplementary chapter deals with resist pattern printing using the silk screen method.

Part three, dealing with basic shop tools, covers the basic range of tools likely to be used by an electronics engineer in the course of his employment, and it follows that some sections of this will be only of academic interest to many readers who have no access to such tools. However, it also deals with many tools which the average home constructor will have in his tool kit.

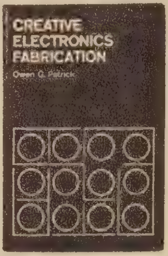
Part four, entitled "Chassis Assembly" is the shortest section of the book, consisting of only nine pages, and deals only with terminal wiring and soldering, and cable lacing. Here again, the reader with little or no experience with these important aspects of electronics will be given a useful grounding in the subject.

The appendix with which the book ends contains a miscellany of extremely useful data including a further 20 pages of printed wiring board information, charts, conversion factors, line drawings of hardware profiles and formulas.

While it is obvious that the book is designed to be used for class tuition under the supervision of an instructor, the amount of information it contains under one cover should make it an extremely useful volume for those interested in the practical aspects of electronics. (H.A.T.)

* * *

CREATIVE ELECTRONICS FABRICATION, by Owen G. Patrick. Published by Holt, Rinehart and Winston Inc., New York. Stiff cover, 9 x 6 inches, 258 pages, freely illustrated with drawings and pictures. Australian price $6.90. Our review copy came from Rigby Limited, 22 James Place, Adelaide, S.A.



As with the other books reviewed on this page, this one is primarily designed for use by students training for a career in electronics. Its author, Owen G. Patrick, is attached to Monterey Peninsula College and the kind of material presented is doubtless of the kind that he has had to compile for college use. Without doubt a great deal of it would be of immediate use to Australian students doing trade courses involving electronic construction, while it could also be a most useful primer to those doing engineering courses with (we should hope) some content of equipment fabrication.

At the same time, the book should be most useful to others who become involved in equipment construction for any other reason. In many cases, efforts of the untrained at fabrication reveal an initial

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Postage 10c; 166 pages.

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Postage 16c; 293 pages.

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Postage 16c; 313 pages.

★ **SINGLE SIDEBAND FOR THE RADIO AMATEUR.** The American Radio Relay League. .. ..
Postage 13c; 253 pages.

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Postage 22c; 330 pages.

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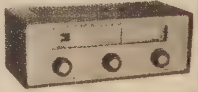

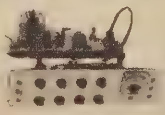

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ɔf planning and an all-round vague-
ıbout metal working techniques, cli-
l by an apparent lack of conviction
the appearance of the finished pro-

at matter how it looks, if it works?

whole aim of this book is to "clue
ts readers on equipment planning, exe-
and finish and I doubt that there
ɔe many, other than professionally
ed people, who will not stand to
t by a study of its pages.

t 1 of the book, involving 9 chapters
bout 50 pages, gives general instruc-
on fabricating electronic equipment.
hapter headings run as follows: Plan-
The Package—Sketching and Draw-
he Plan—Putting the Plan on Metal
earing — Machining Tools — Bending
—Metal Joining—Surface Finishing
Labelling—Assembly and Wiring.

t 2 is in the nature of an exercise
can alternatively be read or, I im-
put into actual practice. Here the
ing material is applied to the design
construction of a signal tracer, not
something we would detail in our
ages. Beginning with an introduction
e proposed circuit, the reader is
through the thinking which leads
choice of loudspeaker, for example,
eneral size and presentation concept,
planning, dimensioning, drawing,
s construction, finishing, construction
signal probe, and finally, the finished
ment.

nost informative section.

n follows a complete section on metal
ng tools ranging from a whole array
asuring and Layout Tools to Solder-
Appliances—Files—Twist Drills—Taps
Dies—Metal Cutting Saws—Screw and
Drivers—Cutting, Gripping, Bending
Crimping Pliers—Abrasive Tools.

s is all freely illustrated.

s may seem rather "old hat" to some
's but the final section deals with
not-so-familiar subjects: Satin Etching
adow Printing — Photostencilling —
ing—Blueing Steel—Harness Wiring
iques—Forming Chassis Corner Tabs
ple Extrusions—Anodising Aluminium
nsformer Mounting.

the end of the book, an appendix
s a variety of reference data, while
rd index allows topics to be found

ogether a most useful volume.
.W.)

RATURE—in brief

**IALGAMATED WIRELESS VALVE
PTY. LTD.** has produced a 24-page
ure entitled "Integrated Circuits Pro-
Guide" which is an applications guide
RCA range of linear and digital in-
ed circuits. In addition to comprehen-
echnical data, the brochure contains
atic diagrams of the integrated cir-
available. (Inquiries should be sent to
gamated Wireless Valve Co. Pty. Ltd.,
e Mail Bag, Ermington, N.S.W.)

**NDARDS ASSOCIATION OF AUS-
IA** is seeking comment on a draft
ard specification for octave, half
and' third-octave band pass filters
led for the analysis of sounds and
ions, issued as Doc. 1059. The prin-
objective of this document is to specify
aracteristics of band pass filters to be
for sound and vibration analysis, for
octave and third-octave band pass
are preferred.

draft prescribes requirements in res-
of design temperature/humidity con-
ion, marking, and electrical and mech-
characteristics considered essential
e accurate performance of these fil-

ies of Doc. 1059 may be obtained
t charge from the headquarters of the association, 157 Gloucester Street, or from the branch offices at capital cities and Newcastle. Comment on the provisions of the draft should reach the association not later than October 31, 1966.

RADIOTRONICS, Vol. 31, No. 3 (July, 1966) has an integrated circuit application note "Application of the RCA-CA3000 integrated circuit amplifier"; an article entitled "An Electronic Precision Timer" concerning the theoretical and practical aspects of building an electronic device to measure up to two seconds with an accuracy of one ten-thousandth of a second; technical details of the Super Radiotron 25TP4 TV picture tube; news items and book reviews. Radiotronics is now published quarterly and costs 50c per copy. (Amalgamated Wireless Valve Co. Pty. Ltd., Private Mail Bag, Ermington, N.S.W.)

TECHNICALITIES, (August, 1966) the new products magazine of Tecnico Electronics Pty. Ltd., has items about the following products: Printed Circuit plating; Pye "Smoothspeed " regulator, "Slidup" variable transformers and joystick controllers; Bach-Simpson volt-ohm-milliammeters, plug-in units and transistor tester; Shaw moisture meters and recording alarm hygrometer; Dytronics Inc. tunable spectrum analyser; Princeton Applied Research lock-in amplifiers and digital voltmeter; F. W. Bell Inc. gaussmeters, multipliers and transducers; Microtest Ltd. power meter and temperature compensated power meter; Thomas Industrial Automation Ltd. universal bridge; Del Electronics Corp. Hi-pot testers; Corona Electric Ltd. oscilloscope plug-in unit; Finnish Cable Works Ltd. contact defect test set; Herga Electric Ltd. foot switches. (Tecnico Electronics Pty. Ltd., Carrington Rd., Marrickville, N.S.W.)

MULLARD-AUSTRALIA PTY. LTD. has available a four-page single-fold brochure listing the Mullard range of Ferroxcube Toroids with comprehensive technical data. This information is reprinted from "Mullard Outlook." The brochure is free on request to Mullard head office at 35-43 Clarence Street, Sydney, but those requiring a copy should send a stamped self-addressed envelope not smaller than foolscap size, endorsed "Ferroxcube."

MINIWATT DIGEST Vol. 5, No. 11 (August, 1966) has an article describing the design of two transistorised electronic photoflash circuits with three ratings of flash discharge, 25, 50 and 100 joules. In the same issue is an article entitled "A Transistorised Metal Detector"; and a quick reference guide to transmitting valves for mobile radio equipment. Subscription rate for "Miniwatt Digest" is $3 per volume

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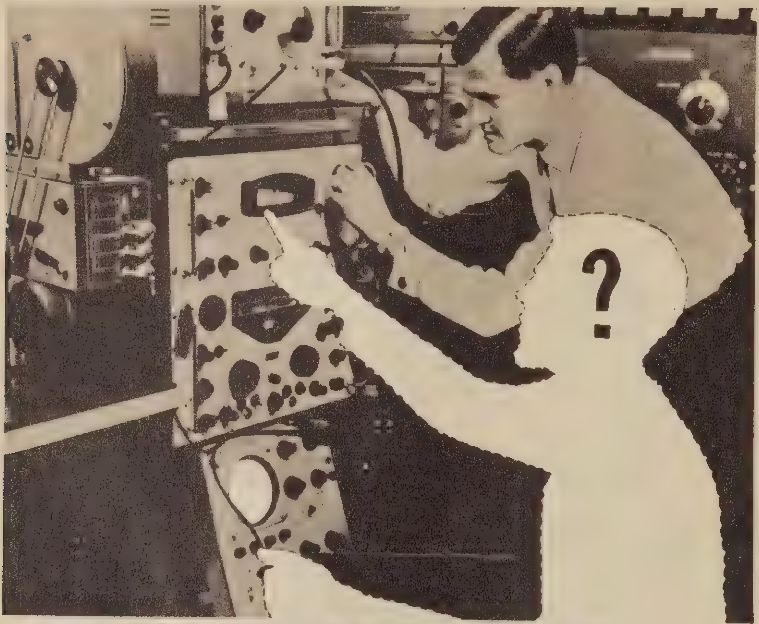

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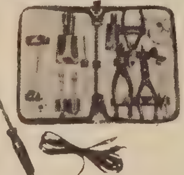

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in the U.S.S.R. The first issue, dated
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Chloresterine; Automatic Investmer
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circuit card cage and the Varicon
tors. (Inquiries to the company'
office at The Crescent, Kingsgrove,

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ARDS** in the U.S.A. has advised
tion of the following:

**Zonal Harmonics in Low Frequen
restrial Radio Wave Propagation,**
Ralph Johler (N.B.S., Technical No
April 1966) 23 pp., U.S.A. price 25
note presents a method of analysis
provides a practical solution to the
gated L.F., V.L.F. and E.L.F. te
waveguide field.

**Quarterly Radio Noise Data, Marc
May, 1965.** by W. Q. Crichlow, R.
ney and M. A. Jenkins (N.B.S. t
Note 18-26, May, 1966) 72 pp.,
price 45c. This note lists radi
measurements made at 18 station
world-wide network and presents the
of these measurements for the mo
March, April and May, 1965.

**Advances in Ionospheric Mapp
Numerical Methods,** by William B
Ronald P. Graham, and Margo
(N.B.S. Note 337) 71 pp., price in
45c. This note describes recent
made at the ESSA Institute for T
munication Sciences and Aeronomy
erly the NBS Central Radio Pro
Laboratory) to improve numerical
for mapping and predicting ion
characteristics used in telecommu

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T.R.F. TUNER

aker" (Grafton, N.S.W.) asks whether e would include, sometime, the circuit a TRF tuner.

is one of a number of letters we eceived of late requesting details of tuner. Why, we don't know, because tuners have scarcely been mentioned mail for some years. We'll see what n do about it. We are glad to know ou have had such good results from BC4 receiver.

"INDUSTRIAL" MULTIMETER

(Yeppoon, Qld.) suggests that there ould be a place in the scheme of ings for what he calls an "industrial" ultimeter. He suggests modest curacy, cheapness, volts AC and DC 20 or so, current to 5 amps, resistnce to 500 ohms.

ust confess that we have never given a unit any thought to date but we not like to say, off hand, that it could "cheap" project, remembering the number of inexpensive imported eters that are on the market these The high current range, particularly C, might present more of a problem you imagine. Another point is that electricians are likely to want somea lot better than "modest" accuracy. give it some thought, however.

OVERSEAS CONSTRUCTORS

(Khulna, E. Pakistan) says that he joys reading "ELECTRONICS Ausalia," but finds that he cannot always tain the parts necessary to build our ojects. He asks whether we could run ecial projects to suit overseas readers. tunately, this is not practical. Firstly, uld have no way of knowing what were available in overseas countries secondly, the availability would probary widely from country to country. can do is to avoid dependence, as possible, on highly specialised coms to give everyone the best possible of using substitutes. This is necesanyway, to meet the Australian n, where it is becoming more diffio predict what individual stockists ve on their shelves.

TAPE RECORDER

Largs Bay, S.A.) has built a push-pull plifier and wants to know how to nnect it to the record play head of tape recorder. He mentions that all r tape recorder circuits to date apar to use single-ended amplifiers.

unately you just can't connect a tape 'play head to an amplifier and expect work. Recording involves feeding ht amount of signal to the head, y compensated in terms of frequency se. Simultaneously, the head must be th supersonic bias of suitable freand amplitude. For playback, adegain must be provided and suitable cy compensation, this having little with whether the amplifier is a single-ended or push-pull type. All this adds up to a considerable amount of circuitry and, for guidance along these lines, we suggest that you check through your back issues for articles on tape adaptors in January 1953, July 1953, January 1961 and November 1962. For general background on tape recorder design, you could read the articles on the Playmaster 110 unit from March to June 1965. We note also your remarks about advertisers "wasting space" with a big picture and a few odd words in big type. In fact, the purpose of most advertising display is to communicate a name or a product, without necessarily attempting at the same time to communicate detailed specifications; that's what sales brochures are for. In raising the matter you are challenging not just advertisers in "ELECTRONICS Australia," but an entire advertising concept.

DEAD LETTERS

We are holding a letter addressed to a **Mr W. Husin, 10 Buxton Rd., Herne Hill,** which has been returned to us by the postal authorities after attempts to deliver it in Western Australia and Queensland. If Mr Husin will indicate the State in which he lives, or any errors in the address, we will forward the letter to him.

We are also holding several letters from a **Mr Ivan Schon, 7 Darch St., Mount Yokine, W.A.** One letter to this address has been returned, and we are advised by the postal authorities that there is no Mount Yokine post office in Western Australia.

BASS RESPONSE

M. McG. (Burwood, N.S.W.) says that he has a pair of Bookshelf speakers but finds that the bass response is not as good as he would like. Could he replace the 6-inch speakers with larger ones but keep the same enclosures?

It is not advisable to use larger loudspeakers in the existing small enclosures because the bass resonance would occur at too high a frequency. We have always stated that the Bookshelf system requires about 5dB of bass boost for balanced reproduction and, under these circumstances, and in the normal listening room environment, a stereo pair of Bookshelf units will give normal and adequate bass and volume level. We do not know anything about the amplifier you are using but wonder whether it is of the general type we advised—with about a 10-watt RMS rating per channel and the facility for variable bass boost. If the amplifier has no such facility, your trouble lies there. On the other hand, if you are the type of listener who likes wall-shaking bass, boosted far above normal musical balance, you may have to start thinking in terms of bigger and more generous loudspeaker systems. But, as we said on other occasions, the Bookshelf speaker system can give most impressive reproduction.

BATTERY CHARGER ERROR?

J. H. E. (Bunbury, W.A.) writes that after reading the magazine ever since 1940, for the first time he has noticed a statement which does not appear to be correct. In the June article on the 1A version of the Simple Battery Charger, we wrote regarding the dissipation in the 1-ohm ballast resistor: "Assuming a charging rate of 1A, the wattage dissipation should be 1W." J. H. E. comments that as a reading on a moving-coil DC ammeter is proportional to average value rather than RMS value, this will correspond to an RMS current of somewhat more than 1A for the full-wave rectified current concerned. Thus the resistor dissipation would be somewhat higher than 1W.

You are academically correct, J.H.E., although we would point out that we didn't actually specify how the 1A charging rate was measured. If a moving-iron repulsion or thermocouple or hot-wire ammeter were used, the reading would be directly in RMS and this error would not occur. We think you'll agree in any case that the point is rather academic as we suggested the use of a 3W or higher unit and showed a 5W type on the circuit and in the photograph. However we enjoyed reading your letter and hope that the magazine continues to be of interest to you.

"ELECTRONICS Australia" INFORMATION SERVICE

TO assist readers, "ELECTRONICS Australia" conducts a technical information service. Conditions governing this service are set out below:—

(1) Address letters to: Assistant Editor, "ELECTRONICS Australia," Box 2728, G.P.O., Sydney.

(2) Requests for copies of circuits or technical information requiring a postal reply must be accompanied by postal note or stamps to the value of $0-20 (2/-). Queries not accompanied by a fee will be answered in rotation on these pages.

(3) For the $0-20 fee, we will supply circuit data, as available, from our files. The amount of data available varies, but in no case can it include information additional to that already published in the magazine. For complicated projects involving material extracted from more than one issue, an extra fee may be requested. As a rule, requests for circuits will be answered more speedily if they are not complicated by questions requiring the attention of technical personnel. Where articles are not on file we can usually provide a photostat copy at $0-20 PER PAGE.

(4) The information service is aimed primarily at assisting readers in matters relating directly to articles published in the magazine. Answers will be given in note form and only so far as can be drawn from general knowledge of the relevant subject. We cannot provide lengthy answers, undertake special research, discuss commercial designs or draw special circuits. Please note that the inclusion of an extra fee does NOT entitle correspondents to special considerations.

(5) The editor reserves the right to return fees or to limit the scope of an individual reply when it is felt that a partial answer will be better than none at all.

(6) In addition to the above service, chassis blueprints are available for most of our projects showing the position of holes and cutouts for metal-working, but containing no details of wiring. Apart from complicated projects like TV sets and oscilloscopes, most blueprints cost $0-50 (5/-) each. Original photographs of most projects are also available, from $0-50 for a 6in x 8in glossy print, postage $0-08 (9d).

(7) "ELECTRONICS Australia" does not deal in radio components nor will we debate the relative merits of competitive products. Prices and specifications should be obtained from advertisers.

(8) Technical queries are not answered by telephone.

(9) We have no file of circuits for commercial radio or TV sets, etc.

(10) A fairly good range of back numbers is available. On issues up to 6 months old there is a surcharge of 5c (6d). On issues from 7 to 12 months old the surcharge is 10c (1/-). Over 12 months, it is 20c (2/-).

READER BUILT IT — continued

nation as to how the circuit operated, but we suggest the following.

The act of closing S1 effectively applies a positive voltage to the base of Tr2, mainly by reason of the charge stored in the 0.1uF capacitor (C6) connected to the base.

This is equivalent to removing the forward bias from Tr2, so that it no longer conducts. With no current through Tr2, the base of Tr3 is forward biased via the 1M resistor to the negative line, so Tr3 conducts.

This allows the base of Tr4 to be forward biased, via Tr3 and the 68K resistor to the negative line. Thus Tr4 conducts and the relay in its collector circuit is energised. This closes the contacts a2 (motor circuit) and a1 (to the phototransistor Tr1).

Note that the base of Tr2 is connected to the collector of Tr4 via a 5.6M resistor. When Tr4 is not conducting the collector end of the 5.6M is virtually at the same potential as the negative rail and therefore contributes to the forward bias of Tr2. When Tr4 conducts the negative potential on its collector decreases. This reduces the forward bias on Tr2 and helps to hold it permanently in a non-conducting condition after this is initiated by the charge on C6.

This condition is maintained, therefore, throughout the playing of the record and until such time as the stylus reaches the run-out groove. When it does, the velocity of the pickup arm suddenly increases, the movement of the vane likewise, and there is a sudden increase in collector current in Tr1.

This moves the emitter of Tr1 closer to the negative rail, generating a negative pulse which is applied via C2 to the base of Tr2. Since this constitutes forward bias for Tr2, the latter conducts, removing the forward bias from Tr3 and Tr4 and renders them non-conducting. The relay then releases, opening the power supply to the turntable.

At the same time, additional forward bias is applied to Tr2 via the 5.6M, the other end of which is once more virtually at negative rail potential. This locks the system in this conditio such time as S1 is opened (thus al C6 to acquire a new charge), closed again to apply this charge base of Tr2 and repeat the cycle a described.

Finally, there is the function relay contacts, a1. After the pick initiated a switch-off pulse and being held in a forward bias con the pickup arm must be returned pickup rest in order to open S1. ever, the action of moving the this manner would result in a pulse being generated in Tr1, thi in the opposite direction since it to a sudden decrease in light.

This would produce a pulse tending to cancel the forward bia causing the motor to be energised By providing the a2 contacts, whic when the relay drops out, Tr2 tected from such a pulse.

In regard to the 5.6M resistor in the bias networks to Tr2, it sho pointed out that, because of th spread of leakage characteristics manium transistors, plus their te ture sensitivity, it may be that ind transistors may need special atten regard to the exact value of th sistors. Alternatively, silicon tra may be considered.

Finally, it would appear that t up lends itself to a facility that be difficult to provide with a mec auto-stop; an override control—a push button would do—to allow th up to be moved to any point n centre of the record without tripp stop mechanism. Such a facility is times useful when it is desired to only the last few grooves of a rec

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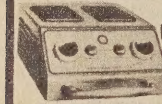

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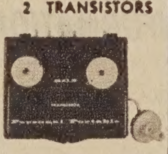

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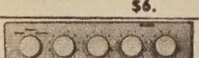

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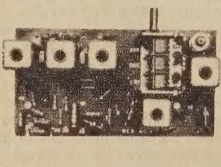

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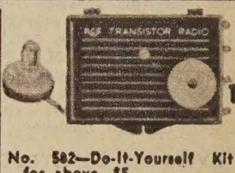

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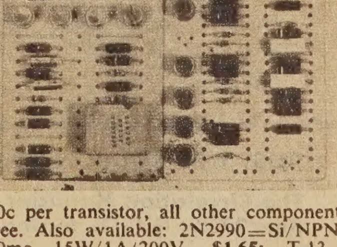

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RCA of Aust. Pty. Ltd. ..
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